User-Calib

"MINI-CALIBRATION PACKAGE"

2270 System

GENRAD, INC.

2270 SYSTEM

"MINI-CALIBRATION PACKAGE"

FOR USE BY

FIELD SERVICE ENGINEERING

AND

ELIGIBLE * GENRAD CUSTOMERS (2270 USERS)

GEN. RAD.
MAR 4 1981
REC. L.A.O.

MODULE - ACZ - 2266-4708
MODULE - DCM - 2266-4712
MODULE - DCS - 2266-4711
MODULE - REF - 2266-4705

SCOPE

This Mini-Calibration Package contains the necessary tools nd diagnostic aids to enable the field service engineering force nd GenRad users of 2270 systems to completely test and calibrate he ACZ, DCS, DCM and REF Modules contained in the system utilizing minimum amount of special tools and test equipment.

This is a module level calibration package only.

Customers who have received formal training from GenRad on the 2270 system.

TOPICAL ADAPTATION BY

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- C O N T E N T S -

ACZ MODULE (AC IMPEDANCE MEASUREMENT BOARD)

DCM DC MEASURE MODULE

DCS DC SOURCE MODULE

REF REFERENCE MODULE (DRIVER/SENSOR)

ACZ MODULE

PART I General Description

Section 1: Set-Up Procedure

Section 2: Current Amplifier Offset Adjustment

Section 3: Board Accuracy Check

APPENDIX A

Further description of program and de-bugging aid for pretest failures.

DCM MODULE

PART I General Description

Section 1: Set-Up Procedure

Section 2: Board Calibration

Section 3: Voltage Range Check

Section 4: Current Range Check

APPENDIX A

Further description of program and de-bugging aid for pretest failures.

DCS MODULE

PART I General Description

PART A - Set-Up And Testing Procedure

Section 1: Voltage Source Calibration And Test

Section 2: Current Source Calibration And Test

Section 3: Dynamic Tests For Both Voltage (V) And Current (I) (allows user to connect an oscilloscope and check waveforms following calibration and test)

REF MODULE

PART I General Description

PART A Set-Up And Testing Procedure

Section 2: Current Source Calibration And Test

Section 3: Dynamic Tests For Both Voltage (V) And Current (I) (allows user to connect an oscilloscope and check waveforms following calibration and test)

REF MODULE

PART I General Description

PART A Set-Up And Testing Procedure

2270 SYSTEM ACZ MODULE CHECK & CALIBRATION

CONTENTS

PART I: General Description

Section 1: Set-Up Procedure

Section 2: Current Amplifier Offset Adjustment

Section 3: Board Accuracy Checks

APPENDIX A

Further description of program and de-bugging aid for pretest failures.

REFERENCE DRAWINGS

2266-4708 1D
2266-4708 2D-1
2266-4708 2D-2
2266-4708 2D-3

RECOMMENDED TEST EQUIPMENT

1 - Scope (not required for calibration)
1 - DVM
1 - 2270-3007 Operational Verification Fixture Asm.
1 - 2270 Card Extender

ACZ Module Calibration

Part I: General Description

This 2270 ACZ Module Accuracy Check and Calibration program is intended for factory use only, however it can be used in the field for module checking and calibration providing certain considerations are taken into account. Namely - system acceptance is based solely on the successful running of the OVP and this program should not be part of any acceptance criteria. If the ACZ fails the OVP the calibration portion of this program can be run in an attempt to correct the error. If the failure persists then the module must be replaced.

The program is divided into three sections as follows:

Section 1: A basic test of the ACZ control and status registers. These tests must be run successfully before proceeding to subsequent testing. (For more details see Appendix A).

Section 2: Current Offset Adjustment - This procedure allows the user to adjust the current to voltage converter offset for 0 volts. It requires a 5 digit DVM and a 152 ohm resistor.

Section 3: Board Accuracy Checks - This section operates the ACZ as a parallel admittance meter. As such, it displays the measured results in terms of CP, GP, and RP parameters. After completing 30 measurements, the following results are output for each parameter. No further adjustments can be made to effect these results, if these tests fail, check using the OVP, if this fails change the module.

1) Highest measured value
2) Percent deviation between highest and average value
3) Average (of 30) value
4) Lowest measured value
5) Percent deviation between lowest and average value.

The above features and how they operate are readily learned by using the system. Some additional information is required to interpret the significance of the diagnostic messages that are output during the initial testing of the ACZ. (See Appendix A).

Section 1: Set-Up Procedure

1) Power down the 2270.

2) Install the ACZ Module Board into its slot in the measurement cage using a card extender.

3) There should be at least one scanner board installed in the first slot of the scanner cage and an instrument mux board installed in the measurement cage.

4) Power up the system.

5) Install the 2270 XXDP+ system disk cartridge into the disk drive and run it up.

   NOTE: User must be booting from XXDP+ disk.

6) Push the 2270 initialize button after the disk drive has indicated it is ready.

7) Key in the following command string to load and run the ACZ module test program.

   R ZMACRG

The GR display should respond with the following message:

```
ACZ MODULE TEST PROGRAM:   VERSION 05, OCT-80

 ********************************************
 **                                        **
 **  ACZ PROGRAM LIMITS 35000 TO 107000    **
 **                                        **
 **   TO RETURN FROM ODT ENTER   66574     **
 **                                        **
 ********************************************

FOR HELP PAGE, TYPE 'ESC'

Insure J6 pins 1 & 2 are shorted together

TO CHANGE VERSION NUMBER TYPE 'I'

This program is set-up to test boards of version #06

All 'unknowns' must be removed from the ACZ Terminals
at this time.

     > > > >   TO CONTINUE, PRESS RETURN < < < <
```

> > > > > > > IMPORTANT NOTICE < < < < < < <

In troubleshooting a defective ACZ board it may be necessary to perform the tests in Appendix A.

Section 2: Current Amplifier Offset Adjustment

This section deals with the only adjustment that one can make on the ACZ module.

To carry out this procedure the operator needs an extender board (2265-4711), a 5 digit DVM and a 152 ohm resistor.

1) Set ACZ status as follows:

* * * ACZ Module Status * * *

Voltage Level ------ 1 VRMS
Frequency ---------- OFF
Bias --------------- OFF
Range -------------- 2
Measurement Mode --- 8 Meas.
Scanner Pins ------- High = Open, Low = Open, Guard = Open

Pin Auto Increment is Disabled

NOTE: Do not attempt to run the ACZ with the frequency set to zero. The program will hang-up when it starts the ACZ. The board timing is derived from the operating frequency.

2) Connect a 152 ohm resistor between the Anode of CR4 and Anode of CR7. (Across the ACZ input).

3) Type Y in response to the question

"Do you wish to make any changes (Y/N)?"
(Have you done 3?)

If 1) is done do not answer question, proceed to 4)

4) Set DVM for DC Volts and connect as follows:

- Lead to analog ground (CR6 anode - unbanded end)

+ Lead to U57 Pin 3.

5) Adjust R8 (Current amplifier offset) for a DVM reading of zero ± 0.001, VDC.

Section 3: Board Accuracy Checks

Upon completion of the amplifier offset adjustment the program proceeds to the accuracy checks, the display is as follows:

```
* * *  ACZ MODULE STATUS * * *

  VOLTAGE LEVEL ----- 1 VRMS
  FREQUENCY --------- 10 KHZ
  BIAS -------------- OFF
  RANGE ------------- 0
  MEASUREMENT MODE -- 8 MEAS.
  SCANNER PINS ------ HIGH = OPEN, LOW = OPEN, GUARD = OPEN

  PIN AUTO INCREMENT IS DISABLED

  Do you wish to make any changes (Y/N)?
  >
```

Before responding to the question take a look at Table 1.

The program expects you to connect standard components (shown in column 3) across the ACZ input (CR4 Anode - CR7 Anode).

Having connected the 10 ohm resistor make sure the status is set up as shown, if not respond to the question with a Y and make the necessary changes. If the status is set up properly then type N <CR>.

The display now shows an * moving from left to right this indicates that the test is being performed and that a sequence of 30 measurements is being taken. Below these measurements are displayed the readings being taken and the average of these readings.

NOTE: If the operator wishes he may type W. A 'W' will appear at the top right hand corner of the display indicating that the measurement will stop after 1 complete cycle and Wait for a response from the operator. Pressing W again will clear this option.

Having taken readings the operator should compare them with those shown in Table 1, Row 1 to test for module accuracy.

To change the Standard Component the operator presses the R key (at any time) and the status display will return. The component should be changed and the status altered if necessary. (See Table 1).

Once satisfied that the set-up is correct the operator may proceed with the next test by typing N <CR>.

NOTE

The ACZ driver program has an optional cross term error correction factor routine built in that is controlled by the 'C' key.

A cross term error is introduced into the CP/GP readings whenever there is any uncompensated phase shift in the amplifiers of the ACZ detector.

When a F.S. GP is connected to the ACZ, a capacitive component appears in the CP reading that does not reflect the true stray capacitance of the ACZ terminals. This CP reading can be either positive or negative depending upon the phase error (LAG or LEAD), and the magnitude of the true stray CP.

The correction factor has its greatest affect on the highest impedance range (range 3) at 10 KHZ. The degree of correction is determined by constants in the program.

If testing the ACZ, it is important that the correction be used only when indicated.

The operator now follows through the tables changing parameters on the "set-up" as required.

TABLE 1

Test	Voltage Level VRMS	Freq (HZ)	Value of Standard Used (OHMS)	Range	RP (AVG) Reading (OHMS)	CP (HI) READING CP (LO) READING (FARADS)
1	1	10K	10	0	9.902 TO 10.133 **(-1.15% TO +1.15%)	± 3.5E-8 (-35 NF TO +35 NF)
2	1	10K	132	0	130.58 TO 133.42 (-1.08% TO +1.08%	± 2.7E-9 (-2.7 NF TO +2.7 NF)
3	1	10K	152	1*	150.79 TO 153.21 (-.796% TO +.796%)	± 2.3E-9 (2.3 NF TO +2.3 NF)
4	1	10K	2K	1	1.980K TO 2.020K (-1.00% TO +1.00%)	± 1.8E-10 (-180 PF TO +180 PF)
5	1	10K	2.58K	2*	2.560K TO 2.600K (-.775% TO +.775%)	± 1.4E-10 (-140 PF TO +140 PF)
6	1	10K	34.7K	2	34.33K TO 35.01K (-.893% TO +.893%)	+1.6E-11 TO -4.3E-12 (+16 PF TO -4.3 PF)

* To change range while * is moving, enter N for next range or enter P for previous range. Also if you wish to restart the sequence of 30 measurements, just hit the enter key.

** Indicates the tolerance limits of RP in percent and of CP in Farads.

IMPORTANT NOTE: The percentage tolerance figures given indicate the acceptable limits in percent around the nominal RP values. It must not be confused with the percentage figures displayed on the GR monitor. The displayed percentages are referred to the average readings and not to the nominal values.

TABLE 2

Test	Voltage Level VRMS	Freq (HZ)	Value of Standard Used (OHMS)	Range	RP (AVG) Reading (OHMS)	CP (HI) READING CP (LO) READING
> > > > > ENTER C TO ACTIVATE THE CROSS TERM ERROR CORRECTION FACTOR < < < < <						
7	1	10K	41.2K	3*	40.85K TO 41.55K (-.850% TO +.850%)	+14.7E-12 TO +2.7E-12 (+14.7 PF TO +2.7 PF)
8	1	10K	OPEN	3	>5E7	+7E-12 TO +1E-13 (+7 PF TO +0.1 PF)
9	1	10K	1M	3	970K TO 1.030M (-3.00% TO +3.00%	+7E-12 TO +1E-13 (+7 PF TO +0.1 PF)
> > > > > > TO CHANGE FREQUENCY ENTER R TO RETURN TO STATUS < < < < < <						
10	1	1K	41.2K	3	40.85K TO 41.55K (-.850% TO +.850%)	±1.9E-11 (-19 PF TO +19 PF)
> > > CROSS TERM IS AUTOMATICALLY DE-ACTIVATED WHEN 100 HZ IS SELECTED < < <						
11	1	100	41.2K	3	40.85K TO 41.55K (-.850% TO +.850%)	±3.1E-10 (-310 PF TO +310 PF)
> > > > DE-ACTIVATE THE CROSS TERM ERROR CORRECTION FACTOR (C KEY) < < < <						
12	0.2	10K	10	0	9.885 TO 10.115 (-1.15% TO +1.15%)	± 3.5E-8 (-35 NF TO +35 NF)
> > > > ENTER C TO ACTIVATE THE CROSS TERM ERROR CORRECTION FACTOR < < < <						
13	0.2	10K	41.2K	3	40.85K TO 41.55K	+14.7E-12 TO +2.7E-12

(-0.85% TO +0.85%) (14.7 PF TO +2.7 PF)

> > > > DE-ACTIVATE THE CROSS TERM ERROR CORRECTION FACTOR (C KEY) < < < <

APPENDIX A

Pretesting

This section is included to describe the steps that are taken by the program at this pretesting time. This section is normally transparent to the operator if the ACZ is basically functional.

The pretest diagnostic works as follows:

1) Test all 3 ACZ registers to determine if they are talking to the LSI-11. If any fail to communicate, print out error message. Wait for repairs to be made.

   ERROR MESSAGE:

   The following ACZ registers would not respond when slotted

   Status Register Defective

   Setup Register Defective

   Data Register Defective

2) Disable ACZ interrupts and then check Bits 15, 13, and 11 of ACZ Status Reg. (All readable bits) for cleared state. If any set, output error message.

ACZ Status Register (772660) Defective

Reg Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Programmed	0	T	0	T	0	X	X	X	X	X	X	X	X	X	X	T
Measured	1	T	0	T	0	X	X	X	X	X	X	X	X	X	X	T

T = Write only Trigger Bit
X = Bit not used

3) Enable normal ACZ interrupts, and then using bit 12 of ACZ status reg., force ACZ to interrupt CPU. If interrupt is not received, output error message.

ACZ Status Register (772660) Defective

Forced interrupt did not occur

4) Enable normal ACZ interrupt mode by setting Bit 13 of status reg. If unexpected interrupt occurs as ACZ becomes enabled, output error message.

ACZ Status Register (772660) Defective

Unexpected interrupt occurred as interrupt was enabled.

APPENDIX A (cont'd)

5) Check interrupt enable bit 13 to determine if it was set. If not, output error message.

ACZ Status Register (772660) Defective

Reg. Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Programmed	0	T	1	T	0	X	X	X	X	X	X	X	X	X	X	T
Measured	0	T	0	T	0	X	X	X	X	X	X	X	X	X	X	T

T = Write only Trigger Bit
X = Bit not used

6) Set ACZ for self check, I mode, 10 KHZ, and range 2, which should cause an overflow interrupt to occur. If not, output error message, and specify states of overflow bit (should be set) and dove bit (should be cleared).

ACZ Status Register (772660) Defective

Interrupt did not occur as expected
Self Check, I mode active on Range 2 at 10 KHZ
Overflow bit should be set, but it is cleared
Done Bit cleared as expected

7) Set ACZ for self check, I mode, 10 KHZ, and Range 1, which should produce a normal measurement.

If not, output error message and specify states of overflow bit (should be cleared) and done bit (should be set).

ACZ Status Register (772660) Defective

Interrupt did not occur as expected
Done bit should be set, but it is cleared
Overflow bit is cleared as expected.

8) Clear all active bits of setup register. Check that all bits are cleared. If not, output error message.

ACZ Setup Register (772664) Defective

Reg. Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Programmed	X	X	X	X	1	1	1	1	1	1	1	1	1	1	1	1
Measured	X	X	X	X	1	1	1	0	1	1	1	1	1	1	1	1

X = Bit not used.

APPENDIX A (cont'd)

9) Set all active bits of set-up register.
Check that all bits are set.
If not, output error message.

ACZ Setup Register (772664) Defective

Reg. Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Programmed	X	X	X	X	1	1	1	1	1	1	1	1	1	1	1	1
Measured	X	X	X	X	1	1	1	0	1	1	1	1	1	1	1	1

X = Bit not used

10) Start ACZ (which sets the Data Reg. to -F.S.) and then before it is changed, read data reg., check the most significant bit to be set. If not set, output error message.

ACZ Data Register (77662) Defective

Reg. Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Programmed	X	X	X	1	0	0	0	0	0	0	0	0	0	0	0	0
Measured	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0

X = Bit not used

11) Wait for the ACZ to finish the measurement in step 10.
If it does not finish in a reasonable time, then, output error message.

Done Bit dod not respond after starting ACZ.

12) Check ACZ identification code.
If not O.K., then, output error message.

IDENT. Register Defective

Reg. Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Programmed	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0
Measured	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0

X = Bit not used

13) Output summary of failed register in the above tests if any were flagged as being defective.

Status Register Defective
Setup Register Defective
Data Register Defective
Ident. Register Defective

Board problem must be corrected before testing can continue.

APPENDIX A (cont'd)

14) Measure self check capacitor at 1 KHZ, on Range 2. If reading is not within ± 3% of 56.9 nF, then, output error message. The program allows you to proceed on past this failure.

> > > > Self Check Capacitor Test Failed < < < <

Normal Value: 5.69 E-8 Microfarads
Tolerance Limits: 5.5193 E=8 to 5.8607 E-8 (± 3%)
Measured Value = 5.925 E-8 microfarads.

2270 SYSTEM DC MEASURE MODULE CHECK - CALIBRATION

CONTENTS:

PART I) GENERAL DESCRIPTION

SECTION 1: SET-UP

SECTION 2: BOARD CALIBRATION

SECTION 3: VOLTAGE RANGE CHECK

SECTION 4: CURRENT RANGE CHECK

REFERENCE DRAWINGS

2266-4712-2D-1
2266-4712-2D-2
2266-4712-2D-3

RECOMMENDED TEST EQUIPMENT

1 - 5.5 DIGIT DVM
1 - PRECIISON DC SOURCE (FLUKE 5100 OR EQUIVALENT)
1 - 2270-3007 OPERATIONAL VERIFICATION FIXTURE ASM
1 - 2270 CARD EXTENDER
NECESSARY CABLES (PRECISION DC SOURCE TO DCM)

DCM MODULE CALIBRATION

PART I) GENERAL DESCRIPTION

This 2270 DCM Module Accuracy Check and Calibration Program is intended for factory use only, however it can be used in the field for module checking and calibration providing certain considerations are taken into account. Namely - system acceptance is based solely on the successful running of the OVP and this program should not be part of any acceptance criteria. If the DCM fails the OVP the calibration portion of this program can be run in an attempt to correct the error. If the failure persists then the module must be replaced.

The features of this program and how they operate are readily learned by using the system. Some additional information is required to interpret the significance of the diagnostic messages that are output during the initial testing of the DCM. (See APPENDIX A)

FULL SCALE CURRENT AND VOLTAGE RANGES
ARE SHOWN BELOW IN TABLE 1.

> > > TABLE 1 < < <

RANGE	FULL SCALE VOLTAGE RNG	FULL SCALE CURRENT RNG
0	± 128 V.	± 160.00 MA.
1	± 32 V.	± 40.00 MA.
2	± 16 V.	± 10.00 MA.
3	± 8 V.	± 2.50 MA.
4	± 4 V.	± 625.00 UA.
5	± 2 V.	± 156.25 UA.
6	± 1 V.	± 39.06 UA.
7	± 250 MV.	± 9.76 UA.

GENERAL DESCRIPTION (CONT'D)

The DCM software driver provides the necessary link between the DCM module and the GR display/keyboard so that the operator can manipulate the module in its various test and calibration modes.

Three basic operating modes are provided.

SECTION 1. CALIBRATION MODE

Before the DCM board can be checked for accuracy, it must first be calibrated. There are approximately 25 calibration tests and adjustments which must be made before the board can function accurately.

SECTION 2. VOLTAGE MEASUREMENT

Voltage measurements are made over a span of 8 ranges. Under software control, the operator can specify a particular range or can use the auto ranging function.

SECTION 3. CURRENT MEASUREMENT

Current measurements are also made over a span of 8 ranges. Under software control the operator can specify a particular range or can use the auto ranging function.

METHOD

The operator must select the various operating modes and operating conditions via the GR keyboard. Voltage calibration measurements will be made at the DCM board. Current calibration and system accuracy checks will be made at the operational verification fixture asm.

SECTION 1. SET-UP PROCEDURE

Install the DCM module board into the measurement cage using a card extender.

There should be at least one scanner board installed in the first slot of the scanner cage and an instrument MUX board installed in slot 32 of the measurement cage.

Install the XXDP+ disk cartridge into the disk drive and then power up the system.

NOTE -- MUST BE BOOTING FROM XXDP+

Push the 2270 initialize button after the disk drive has indicated it is ready.

Key in the following command string to load and run the DCM module test program.

```
R ZMDMRG
```

THE GR DISPLAY SHOULD RESPOND WITH THE FOLLOWING MESSAGE:

```
        DCM MODULE TEST PROGRAM:  VERSION 03,  2-OCT-80

         **********************************************
         **                                          **
         **   DCM PROGRAM LIMITS 35000 TO 114000     **
         **                                          **
         **    TO RETURN FROM ODT ENTER  66452G      **
         **                                          **
         **********************************************

FOR HELP PAGE TYPE "ESC" AT ANYTIME
TO CHANGE THE VERSION NUMBER TYPE "I"
THIS PROGRAM IS SET-UP TO TEST BOARDS OF VERSION NUMBER 04
ALL "UNKNOWNS" MUST BE REMOVED FROM THE DCM TERMINALS AT THIS TIME
```

----- IMPORTANT NOTICE -----

IN TROUBLESHOOTING A DEFECTIVE DCM BOARD IT MAY BE NECESSARY TO PERFORM THE TESTS IN APPENDIX A.

REFER TO APPENDIX A FOR INFORMATION PERTAINING TO THE PRETESTING THAT TAKES PLACE.

```
PRETESTING NOW COMPLETE.  IF THE BOARD HAS ALREADY
BEEN CALIBRATED THE CALIBRATION PRODCEDURE MAY BE
SKIPPED.  DO YOU WISH TO SKIP THE CALIBRATION
PROCEDURE?

(PLEASE ENTER Y OR N)
```

TYPE "Y", "RETURN" IF THE BOARD HAS ALREADY BEEN CALIBRATED AND THE OPERATOR WISHES TOMAKE ACCURACY MEASUREMENTS. THIS ACTION WILL CAUSE THE PROGRAM TO JUMP OVER THE CALIBRATION ROUTINE AND THE MONITOR SHOULD RETURN WITH THE DCM STATUS. JUMP TO VOLTAGE RANGE CHECK - SECTION 4 TO BEGIN ACCURACY TESTING. IF THE BOARD IS TO BE CALIBRATED TYPE "N" "RETURN". THE MONITOR SHOULD RETURN WITH "_IESI_1_" IN THE TOP LEFT CORNER OF THE SCREEN.

SECTION 2. BOARD CALIBRATION

PROCEED WITH THE CALIBRATION AS DIRECTED BY THE DISPLAY. TO ADVANCE TEST STEPS TYPE <CR>.

SECTION 3. VOLTAGE RANGE CHECKS

1. CONNECT PDCS + TO PIN 1 OF DEVICE ADAPTER
2. CONNECT PDCS - TO PIN 2 OF DEVICE ADAPTER
3. INSTALL JUMPER WT3 TO TP1
4. SET BOARD STATUS AS FOLLOWS:

********** DCV STATUS **********

THE BOARD IS SET TO MEASURE VOLTAGE
THE FULL SCALE RANGE VALUE IS 16 VOLTS *
AUTO RANGING IS ACTIVE
SCANNER PINS HIGH = 1A LOW = 2B

* THE ACTUAL FULL SCALE VOLTAGE RANGE DOES NOT MATTER AS THE AUTO RANGING WILL CHANGE THE RANGE AUTOMATICALLY.

4. PERFORM THE INDICATED TESTS OF TABLE 2. CHECK TO SEE THAT THE BOARD IS READING ON THE CORRECT RANGE.

> > > TABLE 2 (PART 1) < < <

SET PDCS (VDC)	AUTO RANGE TO (VDC)	INDICATED READING (VDC)		
+15.90	16	+15.892	TO	+15.908
-15.90	16	-15.892	TO	-15.908
+8.000	16	+7.992	TO	+8.008
-8.000	16	-7.992	TO	-8.008
+4.500	8	+4.492	TO	+4.508
-4.500	8	-4.492	TO	-4.508
+2.000	4	+1.996	TO	+2.004
-2.000	4	-1.996	TO	-2.004
+.5000	1	+.4984	TO	+.5016
-.5000	1	-.4984	TO	-.5016
+.2490	.25	+.2482	TO	+.2498
-.2490	.25	-.2482	TO	-.2498
+25.00	32	+24.96	TO	+25.04
-25.00	32	-24.96	TO	-25.04

> > > TABLE 2 (PART 2) < < <

SET PDCS (VDC)	AUTO RANGE TO (VDC)	INDICATED READING (VDC)		
+64.00	128	+63.950	TO	+64.060
-64.00	128	-63.950	TO	-64.060

A. REMOVE JUMPER CONNECTING WT3-TP1

B. CONNECT JUMPER WT1-WT2 (TESTS K2, K4 1/8 ATTENUATION)

+64.00	128	+63.950	TO	+64.060
-64.00	128	-63.950	TO	-64.060

C. REMOVE JUMPER CONNECTING WT1-WT2

D. CONNECT JUMPER WT3-W14 (TESTS K1, K3 1/8 ATTENUATION)

+64.00	128	+63.950	TO	+64.060
-64.00	128	-63.950	TO	-64.060

E. REMOVE JUMPER CONNECTING WT3-WT4

********* THIS CONCLUDES VOLTAGE ACCURACY TESTS **********

* TYPE R FOR SET PAGE

SECTION 4. CURRENT RANGE CHECKS

1. SET-UP DCM AS FOLLOWS:

```
****************** DCM STATUS ********************
THE BOARD IS SET TO MEASURE CURRENT
THE FULL SCALE RANGE VALUE IS 160 MA   *
AUTO RANGING IS ACTIVE
SCANNER PINS    HIGH = 1A    LOW = 2B
```

* THE ACTUAL FULL SCALE RANGE DOES NOT MATTER AS THE AUTO RANGING WILL SET THE RANGE AUTOMATICALLY.

2. CONNECT PDCS + TO PIN 1 OF DEVICE ADAPTER

3. CONNECT PDCS - TO PIN 2 OF DEVICE ADAPTER

4. PERFORM INDICATED TEST OF TABLE 3. CHECK TO SEE THAT THE BOARD IS READING ON THE CORRECT RANGE.

> > > TABLE 3 (PART 1) < < <

SET PDCS	AUTO RANGE TO	INDICATED READING
+159.000 MA	160 MA	+158.840 MA TO +159.160 MA
-159.000 MA	160 MA	-158.840 MA TO -159.160 MA
+80.000 MA	160 MA	+79.840 MA TO +80.160 MA
-80.000 MA	160 MA	-79.840 MA TO -80.160 MA
+45.000 MA	160 MA	+44.840 MA TO +45.160 MA
-45.000 MA	160 MA	-44.840 MA TO -45.160 MA
+40.000 MA	160 MA	+39.840 MA TO +40.160 MA
-40.000 MA	160 MA	-39.840 MA TO -40.160 MA
+20.000 MA	40 MA	+19.960 MA TO +20.040 MA
-20.000 MA	40 MA	-19.960 MA TO -20.040 MA
+5.000 MA	10 MA	+4.990 MA TO +5.010 MA
-5.000 MA	10 MA	-4.990 MA TO -5.010 MA
+1.250 MA	2.5 MA	+1.248 MA TO +1.252 MA
-1.250 MA	2.5 MA	-1.248 MA TO -1.252 MA

> > > TABLE 3 (PART 2) < < <

SET PDCS	AUTO RANGE TO	INDICATED READING
+312.0 UA	625 UA	+311.4 UA TO +312.6 UA
-312.0 UA	625 UA	-311.4 UA TO -312.6 UA
+78.00 UA	156.25 UA	+77.84 UA TO +78.16 UA
-78.00 UA	156.25 UA	-77.84 UA TO -78.16 UA
+20.00 UA	39.06 UA	+19.96 UA TO +20.06 UA
-20.00 UA	39.06 UA	-19.96 UA TO -20.06 UA
+9.000 UA	9.76 UA	+8.992 UA TO +9.008 UA
-9.000 UA	9.76 UA	-8.992 UA TO -9.008 UA

********** THIS CONCLUDES CURRENT ACCURACY TESTS **********

APPENDIX A

DC MEASURE MODULE CALIBRATION

INDEX

PART I - INTRODUCTION - DCM DRIVER PROGRAM
PART II - DCM REGISTER DESCRIPTIONS

PART I INTRODUCTION - DCM DRIVER PROGRAM

THE 2270 DCM MEASUREMENT MODULE TEST PROGRAM IS DESIGNED AS A STAND ALONE PROGRAM TO DRIVE THE 2266-4712 DCM MEASUREMENT MODULE. THERE ARE THREE MODES OF OPERATION.

SECTION 1. PRETESTING
SECTION 2. CALIBRATION
SECTION 3. MEASUREMENT (NORMAL OPERATION)

SECTION 1. PRETESTING

THIS SECTION IS INCLUDED TO DESCRIBE THE STEPS THAT ARE TAKEN BY THE PROGRAM AT THIS PRETESTING TIME. THIS SECTION IS NORMALLY TRANSPARENT TO THE OPERATOR IF THE DCM IS BASICALLY FUNCTIONAL.

1. TEST BOTH DCM REGISTERS TO DETERMINE IF THEY ARE TALKING TO THE LSI-11. IF ANY FAIL TO COMMUNICATE, PRINT OUT ERROR MESSAGE. WAIT FOR REPAIRS TO BE MADE.

   STATUS REGISTER TIMED OUT
   DATA REGISTER TIMED OUT

2. IF THERE ARE NO TIMEOUT FAILURES THE STATUS REGISTER IS THEN CHECKED TO SEE IF ALL THE BITS ARE WORKING. FIRST THE STATUS REGISTER IS CLEARED. IT IS THEN READ TO SEE THAT ALL THE R/W BITS ARE CLEARED. IF THEY ARE NOT AN ERROR MESSAGE WILL APPEAR.

DCM STATUS REGISTER (172700) DEFECTIVE

REG. BITS	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PROGRAMMED	T	0	X	X	0	0	0	X	X	X	X	0	0	0	0	T
MEASURED	T	1	X	X	0	0	0	X	X	X	X	0	0	0	0	T

T = WRITE ONLY TRIGGER BIT

X = BIT NOT USED

3. THE READ/WRITE BITS OF THE STATUS REGISTER ARE THEN PROGRAMMED TO BE SET. THE BITS ARE THEN CHECKED TO SEE IF THEY RESPOND AS BEING SET. IF THEY DO NOT, AN ERROR MESSAGE IS DISPLAYED.

DCM STATUS REGISTER (172700) DEFECTIVE

REG. BITS	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PROGRAMMED	T	1	X	X	1	1	1	X	X	X	X	1	1	1	1	T
MEASURED	T	1	X	X	0	0	1	X	X	X	X	1	1	1	1	T

T = WRITE ONLY TRIGGER BIT

X = BIT NOT USED

4. THE DATA REGISTER IS NOW CHECKED FOR PROPER OPERATION. FIRST THE A/D CONVERTER IS CHECKED TO SEE IF IT IS WORKING. A MEASUREMENT IS STARTED AND A DATA READING IS TAKEN RIGHT AWAY BEFORE THE CONVERSION IS COMPLETE. AFTER A PRE-DEFINED TIME ANOTHER DATA READING IS TAKEN AND COMPARED WITH THE FIRST. THE TWO READING SHOULD BE DIFFERENT. IF THEY ARE NOT A DEFECTIVE DATA REGISTER MESSAGE WILL APPEAR.

DATA REGISTER DEFECTIVE

5. THE DONE BIT IS NOW CHECKED FOR PROPER OPERATION. A MEASUREMENT CONVERSION IS STARTED AND THE DONE BIT IS CHECKED RIGHT AWAY BEFORE THE CONVERSION SHOULD HAVE COMPLETED. IF THE DONE BIT IS LOW (CONVERSION COMPLETE) AN ERROR MESSAGE WILL APPEAR.

DONE BIT STUCK LOW

IT IS THEN CHECKED 50 MICRO-SECONDS LATER. BY THIS TIME THE CONVERSION SHOULD BE COMPLETE. THE DONE BIT IS CHECKED, IF IT IS HIGH (CONVERSION NOT COMPLETE) AN ERROR MESSAGE IS RETURNED.

DONE BIT STUCK HIGH

6. THE IDENT REGISTER IS CHECKED TO SEE IF THE BOARD IDENT IS THE SAME AS THE PROGRAM IDENT. IF THE TWO IDENTS ARE NOT THE SAME THE PROGRAM IDENT AND THE BOARD IDENT WILL BE DISPLAYED. THE PROGRAM VERSION NUMBER (LAST 6 BITS) CAN BE CHANGED BY HITTING I ON THE BEYBOARD AND ENTERING THE APPROPRIATE VERSION NUMBERS.

SECTION 2. CALIBRATION

THE CALIBRATION ROUTINE RUNS THROUGH A PROCEDURE FOR BRINGING UP THE DCM (2266-4712). INSTRUCTIONS FOR THE OPERATOR ARE DISPLAYED ON THE GR MONITOR AND BOARD STATUS IS AUTOMATICALLY CONTROLLED BY SOFTWARE FOR EACH PARTICULAR TEST. WHILE IN THE CALIBRATION PROCEDURE, THE OPERATOR CAN JUMP BACK TO THE BEGINNING OF THE CALIBRATION PROCEDURE BY HITTING A "C" AND THEN SUCCESSIVE "RETURNS" UNTIL THE DESIRED TEST IS REACHED.

THE "F" KEY WILL CLEAR THE HI AND LO RECORDED DATA ON DISPLAYED BOARD MEASUREMENTS.

THE "RETURN" KEY WILL MOVE THE PROGRAM ON TO THE NEXT TEST OR SET OF INSTRUCTIONS.

SECTION 3. MEASUREMENT

IN THIS MODE, THE BOARD IS SET TO MAKE MEASUREMENTS. THE OPERATOR HAS FULL CONTROL OVER WHAT AND HOW THE BOARD MAKES A MEASUREMENT. TO CHANGE THE DCM STATUS, THE OPERATOR SHOULD ENTER "R", "Y", "RETURN". THE OPERATOR CAN SET UP THE DCM AS NECESSARY TO MAKE PARTICULAR MEASUREMENTS.

WHILE THE BOARD IS MAKING MEASUREMENTS THE OPERATOR CAN CONTROL:

RANGING - KEYING IN "N" (NEXT) WILL PUT THE DCM ON THE NEXT HIGHER RANGE (HOLD RANGE) IF THE BOARD IS AT THE HIGHEST RANGE (128 VDC OR 160 MA.) THE AUTO RANGING MODE WILL BE ACTIVATED AFTER THE NEXT "N" KEYSTROKE.

KEYING IN "P" (PREVIOUS) WILL DEACTIVATE THE AUTO RANGING MODE IF IT IS ACTIVE. IF AUTO RANGING IS NOT ACTIVE, THE RANGE WILL BE SET AT THE NEXT LOWER RANGE.

STOP MEASUREMENT - KEYING IN "S" WILL STOP DCM MEASUREMENT (PAUSE).

START MEASUREMENT - KEYING IN "Q" WILL RESTART DCM MEASUREMENT (CONTINUE FROM PAUSE). IT WILL NOT AFFECT ANY DATA.

KEYING IN "RETURN" WILL RESTART DCM MEASUREMENT AND WILL CLEAR THE HI AND LO RECORDED DATA.

CLEARING HI/LO DATA - KEYING IN "F" WILL CLEAR HI AND LO INDICATED DATA.

HITTING "RETURN" WILL ALSO CLEAR HI AND LO INDICATED DATA.

CONTROL KEYS WHICH MAY BE HIT AT ANY TIME

1. "Z" RETURNS TO BEGINNING OF PROGRAM

2. "R" JUMPS TO DCM STATUS OUTPUT

3. "I" JUMPS TO ROUTINE TO CHANGE IDENT. CODE

4. "C" JUMPS TO BEGINNING OF CALIBRATION ROUTINE

5. "O" JUMPS TO ODT

PART II REGISTER ACCESS DEFINITIONS

IN THE TABLES BELOW, THE FOLLOWING CODES WILL BE USED TO INDICATE THE TYPE OF ACCESS BY THE CPU TO THE REGISTER BITS.

R/W	READ/WRITE BIT
R	READ ONLY BIT
T	TRIGGER BIT (WRITE ONLY)

> > > DCM STATUS REGISTER (172700) < < <

BIT	OCTAL NO.	ACCESS TYPE	NAME FUNCTION	DESCRIPTION/OPERATION
15	100000	R	BUSY	BOARD BUSY
14	40000	R/W	I/V	VOLTAGE/CURRENT SELECT
13	20000	R	VOL	VOLTAGE OVERLOAD
12	NOT USED			
11	4000	R/W	DCV RANGE	VOLTAGE RANGE SELECT (MSB)
10	2000	R/W	DCV RANGE	VOLTAGE RANGE SELECT
9	1000	R/W	DCV RANGE	VOLTAGE RANGE SELECT (LSB)
8-5	NOT USED			
4	20	R/W	DCI RANGE	CURRENT RANGE SELECT (MSB)
3	10	R/W	DCI RANGE	CURRENT RANGE SELECT
2	4	R/W	DCI RANGE	CURRENT RANGE SELECT
1	2	R/W	DCI RANGE	CURRENT RANGE SELECT (LSB)
0	1	T	START	START MEASUREMENT

NAME	FUNCTION
BUSY	THE A/D CONVERTER IS IN PROCESS
I/V	CURRENT VOLTAGE MODE BIT. (I/V IS HIGH FOR CURRENT MODE)
VOL	VOLTAGE IS OVER 128 VOLTS OR 128 VOLT RANGE SHOULD BE USED

V2-V0 — VOLTAGE RANGE CODE

BITS 11 (V2)	10 (V1)	9 (V0)		
0	0	0	=	16V
0	0	0	=	4V
0	1	0	=	1V
0	1	1	=	.25V
1	0	0	=	128V
1	0	1	=	32V
1	1	0	=	8V
1	1	1	=	2V

I3-I0 — CURRENT RANGE CODE

BITS 04 (I3)	03 (I2)	02 (I1)	01 (I0)		
0	0	0	0	=	160 MA
0	0	0	1	=	40 MA
0	0	1	0	=	10 MA
0	0	1	1	=	2.5 MA
0	1	0	0	=	625 UA
0	1	0	1	=	156.25 UA
0	1	1	0	=	39.06 UA
0	1	1	1	=	9.76 UA

START	START CONVERSION. THE A/D CONVERTER IS ACTIVATED.

> > > DCM DATA REGISTER (172702) < < <

BIT	OCTAL NO.	ACCESS TYPE	NAME FUNCTION	DESCRIPTION/OPERATION
15-14			NOT USED	
13		R	CNT13	DATA BIT 13 (SIGN BIT)
12		R	CNT12	DATA BIT 12
11		R	CNT11	DATA BIT 11
10		R	CNT10	DATA BIT 10
9		R	CNT9	DATA BIT 9
8		R	CNT8	DATA BIT 8
7		R	CNT7	DATA BIT 7
6		R	CNT6	DATA BIT 6
5		R	CNT5	DATA BIT 5
4		R	CNT4	DATA BIT 4
3		R	CNT3	DATA BIT 3
2		R	CNT2	DATA BIT 2
1		R	CNT1	DATA BIT 1

2270 SYSTEM DCS MODULE CHECK CALIBRATION

CONTENTS

PART I: GENERAL DESCRIPTION

PART A - SET-UP PROCEDURE

Section 1: Voltage Source Calibration and Test

Section 2: Current Source Calibration and Test

Section 3: Dynamic Tests for both Voltage (V) and Current (I) (Allows user to connect an oscilloscope and check waveforms following calibration & test)

REFERENCE DRAWINGS

2266-4711 sh.1,2 - Schematic

2266-4711 sh.1,2 - Assembly

RECOMMENDED TEST EQUIPMENT

1 - 5.5 Digit DVM

1 - Scope

1 - 2270 Card Extender

(Console Device - VT100 or New GR Console)

*** NOTE ***

THIS DCS MODULE USES STATIC SENSITIVE DEVICES
THEREFORE USE THE NECESSARY PRECAUTIONS.

DCS Module Calibration

Part I: General Description

This 2270 DCS Module Accuracy Check and Calibration program is intended for factory use only, however it can be used in the field for module checking and calibration providing certain considerations are taken into account. Namely - system acceptance is based solely on the successful running of the OVP and therefore this program should not be part of any acceptance criteria. If the DCS fails the OVP the calibration portion of this program may be run in an attempt to correct the error. If the failure persists then the module must be replaced.

The program is divided into three sections as follows:

Section 1: Voltage Source Calibration and Test

Allows user to calibrate and check the DC Voltage Source.

Section 2: Current Source Calibration and Test

Allows user to calibrate and check the DC Current Source.

Section 3: Dynamic Tests

Verification of calibrations and tests utilizing an oscilloscope.

*** NOTE ***

THIS PROGRAM FOLLOWS INITIAL SET-UP PROCEDURE WHICH IS DESCRIBED BEGINNING ON THE FOLLOWING PAGE.

PART A: Set-Up Procedure

1) Power down the 2270 system.

2) Install the DCS Module into its slot * in the measurement cage utilizing a card extender.

3) Install the 2270 XXDP+ system disk cartridge into the disk drive and power it up.

4) After the disk drive has indicated it is ready push the 2270 initialize button.

5) Key in the following command string to load and run the DCS Module Test and Calibration program:

R ZMDSRG

The GR console Device should respond with the following message:

```
DCS PROGRAM LIMITS 35000  TO  110100
TO RETURN FROM ODT ENTER 41624G
```

*** NOTE ***

The test routines used in this procedure are written such that as we proceed through the program to the next step, by pressing the RETURN key on the keyboard, the program sets up various tests and a message is displayed dictating further action.

At this point the system will next (following a RETURN keystroke) ask for you to indicate "WHICH SLOT TO RUN TEST" as displayed on the console device, an illustration of which is shown on the next page.

* See illustration and notation(s) on the next page concerning "slot".

Following the display of the DCS program limits which indicates the beginning of the DCS Module Check and Calibration the system will display the following message:

```
.....................................................

PLEASE INDICATE WHICH SLOT TO RUN TEST

INPUT                        TO TEST SLOT..#
0 or RET.....................SLOT # 36
  1.....................SLOT # 26
  2.....................SLOT # 24
  3.....................SLOT # 22
```

NOTE: DO NOT ATTEMPT TO CALIBRATE OR TEST DCS IN SLOT #22 IF HIGH CURRENT SOURCE IS PRESENT.

Next Message:

```
READY TO CALIBRATE DC SOURCE BOARD

TO CONTINUE PRESS RETURN

>
```

Next Message:

```
        ******************************************
        *                                        *
        *   PLEASE  INDICATE  WHICH  TEST        *
        *                                        *
        *   YOU  WISH  TO  PROCEED  TO:          *
        *                                        *
        ******************************************


        V..............  Voltage Calibration
        I..............  Current Calibration
        D..............  Dynamic Tests
        X..............  Re-Boot System

>
```

** NOTE **
AT THIS POINT IN TIME YOU MAY WISH TO REMOVE THE CONSOLE DEVICE (GR DISPLAY) FROM ITS SHELF AND PLACE IT ON THE TOP OF THE SYSTEM SO THAT IT CAN BE VIEWED FROM THE REAR OF THE SYSTEM.

Section 1: Voltage Source Calibration and Test

This section allows the user to calibrate and check the DC Voltage Source.

Includes:

a. (V DAC) - Digital to Analog Converter Offset Adj.
b. (V DAC) - Digital to Analog Gain Adj.
c. (V DAC) - Digital to Analog +FS Test
d. Offset Calibration and Test

Adjusts:

a. R26, R27, R34, R29.

Sequence:

Step # 1 Setup
Step # 2-4 Adjustments
Step # 5-8 Calibration
Step # 9-28 Test Steps

Section 2: Current Source (DC) Calibration and Test

This section allows the user to calibrate and check the DC Current Source.

NOTE: Values displayed are based on load resistors of ±.01%. If other loads are used adjust limits accordingly.

Includes:

a. (I DAC) - Digital to Analog Converter Calibration
b. (I DAC) - Digital to Analog Converter Offset Calibration
c. (I DAC) - Digital to Analog Converter Test

Adjusts:

a. R66, R59, R63, R102.

Sequence:

Step # 1	Set-Up
Step # 2-5	Calibration Steps
Step # 6	Set-Up - Utilizing precision load resistors across TP 86 - TP 87, these range from 10 Ohms to 10K Ohms.
Step # 7	Calibration
Step # 8-20	Test Steps

Section 3: Dynamic Tests for both Voltage(V) and Current(I):

V..... Dynamic Voltage Tests
I..... Dynamic Current Test
R..... Return to Main

PRESENT SYSTEM MESSAGE IS LISTED ABOVE BEFORE YOU CAN CONTINUE WITH PROGRAM.

* Uses oscilloscope to test and indicate DC Voltage and DC Current Outputs.

Voltage Test # 1

RANGE = 16 V - Displays expected waveforms. Dynamic test will run following the execution of a RETURN.

The following ranges are then indicated as listed:

Test # 2 RANGE = 4 V

Test # 3 RANGE = 1 V

Test # 4 RANGE = .25 V

Current Test # 1

RANGE = 128 MA - Displays expected waveform. Dynamic test will runn following the execution of a RETURN.

PROGRAM NOW COMPLETE

2270 SYSTEM DRIVER/SENSOR REFERENCE MODULE

CALIBRATION AND CHECK

CONTENTS

PART I: GENERAL DESCRIPTION

PART A - SET-UP AND TESTING PROCEDURE

REFERENCE DRAWINGS

2266-4705 2D 1,2,3 - Schematic
2266-4705 - Assembly

RECOMMENDED TEST EQUIPMENT

1 - 5.5 Digit DVM
1 - 2270 Card Extender

D/S Reference Module Calibration

Part I: General Description

Driver/Sensor Reference Board Adjustment and Calibration program is intended for factory use only, however it can be used in the field for module checking and calibration providing certain considerations are taken into account. Namely - system acceptance is based solely on the successful running of the OVP and therefore this program should not be part of any acceptance criteria. If the D/S Reference Board fails an OVP then the calibration portion of this program may be run in an attempt to correct the error. If the failure persists, then the module must be replaced.

This program "Filename ZDRFRG.BIN" may be used to adjust and verify the D/S Reference Board in either processor controlled system, (11/02) or (11/23) as well as any digital configuration.

PART A: Set-Up And Testing Procedure

1) Place the reference board to be tested on an extender board.

2) Boot the XXDP+ disk.

3) Run ZDRFRG.BIN

Program will ask for cage to be tested. Cage #1 refers to the master cage or location of the first D/S bd. Cage #2 is the location of the slave cage. Exceptions are noted on the display.

4) Using a 5.5 Digit DVM connect the ground lead to TP 93 located near Q 18) and the positive lead to TP 1. Adjust pot labeled VPHA (R1) for -5 Volts ± 60uV.

5) Continue program with <CR>. Without moving DVM leads adjust pot labeled "GAIN" for 0 Volts ± 50uV (R17).

6) Adjust succeeding reference voltages by moving + DVM lead to TP 2 thru TP 16 and adjusting corresponding pots for 0 Volts ± 50uV.

7) Continue program by striking <CR>. By moving + DVM lead to TP 1 thru TP 16 verify -5 Volts ± 60uV at all points.

8) In order to run the slave cage reference board or another reference board it will require rebooting and re-running the program answering the displayed questions appropriately.

INTRODUCTION

Scope Of Manual.

General

This manual is designed to provide the Field Service Engineer and GenRad Maintenance Trained Users, with the necessary instructions to effectively utilize the Diagnostic Package.

The Diagnostic Package will enable the isolation of failures or the verification of function of individual modules and peripherals associated with the 2270 and 2290 systems.

This manual contains:

A directory listing of the DEC, GenRad modified DEC and GenRad diagnostic programs with a brief description of each where necessary.

A more detailed description of the DEC and GenRad modified DEC diagnostics, for the processor cages and drives.

A thorough explanation of the use of the diagnostics.

An Appendix containing instructions and explanations useful in the effective further use of the diagnostic package.

An Addendum containing a DEC explanation of the uses of XXDP+.

A Minicalibration Procedure to be used on the AC and DC measurement modules as well as the Driver Sensor Reference Module of the 2270.

This Diagnostic Package is an adaption of programs and procedures intended for factory use. In as such certain criteria must be set for field use. Namely -- system acceptance is based <u>solely</u> on the successful running of the OVP and this Diagnostic Package should <u>not</u> be considered as any part of an acceptance criteria.

Related Publications.

The publications necessary for the effective use of the Diagnostic Package are listed below:

2270	Theory and Maintenance Manual	2270-0105 2270-0106
2270	Diagrams	2270-0108-B
2290	Theory and Maintenance Manual	2290-0105-B
2290	Diagnostics	2290-0108 2290-0109

THE FOLLOWING IS A DIRECTORY AND BRIEF IDENTIFICATION OF THE 2270 AND 2290 DIAGNOSTIC PROGRAMS APPEARING ON THE XXDP+ MEDIUM.

FILENAME	FUNCTION (XXDP+ SYSTEM)
DY1YA0.SYS	XXDP+ System
HMDYA0.SYS	"
HDDRA1.SYS	"
HDDKA0.SYS	"
HMDKA0.SYS	"
HDDPA0.SYS	"
HDDLA1.SYS	"
HDDMA0.SYS	"
HDDSA0.SYS	"
HDDTA0.SYS	"
HDDXA0.SYS	"
HDDYA0.SYS	"
HDKBA0.SYS	"
HDMMA0.SYS	"
HDMTA0.SYS	"
HDPDA0.SYS	"
HDPPA0.SYS	"
HDPRA0.SYS	"
HDPTA0.SYS	"
HDDDA0.SYS	"
HDDBA0.SYS	"
HDCTA0.SYS	"
HDMSA0.SYS	"
HSAAA0.SYS	"

HUDIA0.SYS "

GRDKA0.SYS "

FILENAME	FUNCTION (2270)
DVKAAA.BIN	DEC LSI-11 Basic Instructions Test 11/02 ONLY
DVKABA.BIN	DEC LSI-11 EIS Instructions Test 11/02 ONLY
DVKACC.BIN	DEC LSI-11 FIS Instructions Test 11/02 Modified for 30K Memory
DVKADC.BIN	DEC LSI-11 Traps Test 11/02 Modified for 30K Memory
DVKAEB.BIN	DEC DLV11 Serial Line Unit Test 11/02
VDVCB0.BIC	DEC DLV11 11/23
DZKMAE.BIN	DEC 0 TO 128K MOS Memory Test 11/02 Modified for 30K Memory
ZKMAF1.BIC	DEC Memory Test 11/23
JKDBB0.BIN	DEC LSI-11/23 CPU Test
JKDAB0.BIN	DEC LSI-11/23 MMU Test
ZICDCA.BIN	GR Console Display Test 11/02 and 11/23
DVKIBA.BIN	DEC IBV11-A IEEE I/O Bus Card Test
RKTEST.CCC	RK11/RK05 Chained Diagnostics
ZRKJE0.BIC	DEC RK11 Basic Logic Test 1
ZRKKF0.BIC	DEC RK11 Basic Logic Test 2
ZRKLE0.BIC	DEC RK11/RK05 Dynamic Test
ZRKHG0.BIC	DEC RK11/RK05 Performance Exerciser
ZPQAOC.BIN	GR QAFC Test 11/02
JPQACB.BIN	GR QAFC Test 11/23
ZISPOA.BIN	GR Strip Printer Function Test 11/02
JISPCA.BIN	GR Strip Printer Function Test 11/23
ZIRTCC.BIN	GR Real Time Clock Test 11/02
JIRTCC.BIN	GR Real Time Clock Test 11/23

ZITICA.BIN GR Timer Troubleshooting Test

FILENAME	FUNCTION (2270)
ZMDSRG.BIN	GR DC Voltage and Current Source Calibration and Verification Test 11/02 or 11/23
ZMDMRG.BIN	GR DC Voltage and Current Measure Calibration and Verification Test 11/02 or 11/23
ZMACRG.BIN	GR Impedance Measure Calibration and Verification Test 11/02 or 11/23
ZMRGCB.GIN	GR Relay Ground Test 11/02
JMRGCA.BIN	GR Relay Ground Test 11/23
ZDRFRG.BIN	GR D/S Reference Calibration and Verification Test 11/02 or 11/23 and Any Digital Configuration
ZDCTOC.BIN	GR D/S Controller Test 11/02
JDCTCA.BIN	GR D/S Controller Test 11/23
ZDDSOJ.BIN	GR D/S Board Test 11/02
JDDSCA.BIN	GR D/S Board Test 11/23

FILENAME	FUNCTION (2290)
USERCK.CCC	CPU Diagnostic Chain
FKAAC0.BIC	11/34 Basic Instruction Test
FKABC0.BIC	11/34 Traps Test
FKACA0.BIC	11/34 EIS Test
ZM9BC0.BIC	Boot Board Test
CMFAF0.BIC	Memory Test
FKTHB0.BIC	11/34 MMU Test
ZDLDC0.BIC	DL11-W Serial Line/RTC
ZDZAE0.BIC	8 Line Async. MUX Test
DISKCK.CCC	Drive Diagnostic Chain
ZLACF0.BIN	LA36 DECWRITER Test
ZDZBB0.BIN	DZ Maintenance Mode Test (FS)
ZQMCF0.BIC	0-124K Memory Exerciser
FKTGB1.BIC	Memory Management Exerciser (needs board)
PWRFL.BIC	11/34 Power Fail Test
ZLPAB1.BIN	Line Printer Test

FILENAME	FUNCTION
SETUP.BIN	SUPERVISOR MODE XXDP+
COPY1.FUN	XXDP+ COPY PROGRAM (2290 FLOPPY)
2270DX.BIN	2270 DEC EXERCISER
RKDP.BIN	XXDP WILL RESPOND TO NEW MONITOR
UPD4.BIN	XXDP UPDATE PROGRAM 4
UPD2.BIC	XXDP UPDATE PROGRAM 2
XTECO.BIN	XXDP TECO EDITOR
ZPFDCA.BIN	2270 FLOPPY DRIVE DIAGNOSTIC
ZRKIF0.BIN	2270 FORMAT/VERIFIER
COPY1.BIN	COPY PROGRAM; FROM ONE XXDP+ DISK TO ANOTHER
DX1134.BIN	SYSTEM EXERCISER (2290)
HELP.TXT	HELP TEXT

THE FOLLOWING IS A LIST OF EACH 2270 DIAGNOSTIC THAT IS RUN ON THE PROCESSOR CAGE AND A BRIEF DESCRIPTION OF EACH.

DVKAAA LSI-11 Basic Instruction Test: This program tests all basic instructions of the LSI11 (except trap-type) which includes Control Chip, Data Chip, Microms, PLA and other circuitry on the LSI-11 CPU module. This diagnostic does not make a pass with the T-Bit set. The trap test should also be run to completely verify the basic LSI-11.

DVKABA LSI-11 Extended Instruction Set Test: This diagnostic program tests the LSI-11 extended instruction set (ASH, ASHC, MUL, and DIV) using registers 0-5 at least once with each instruction. It is also checked that the extended instruction set can be interrupted.

DVKACC LSI-11 Floating Instruction Set Test: This diagnostic program tests the LSI-11 floating instruction set (FADD, FSUB, FMUL, and FDIV) options with fixed number patterns using each register at least once as the stack pointer. It also checks stack overflow and that the floating instruction set can be interrupted.

DVKADC LSI-11 Traps Test: This is a test of all operations and instructions that cause traps. Also tested are trap overflow conditions, oddities of register 6, interrupts and reset and wait instructions.

ZKMAF1 11/23 MOS/CORE 0-128K Memory Exerciser: This diagnostic will test 0-128K of MOS or CORE on any PDP 11 family computer. Some tests are worst case for MOS and some for CORE, but all tests are always run. The test occupies less than 2K of memory, so it can be used to test a system with only 4K of memory.

DZKMAE 11/02 MOS/CORE 0-30K Memory Exerciser: This diagnostic is "ZKMAF1" modified for 30K.

DVKAEB 11/02 IBV11-A Diagnostic: This program allows the user to check out the IBV11-A interface option. In order to check out a greater portion of logic on this option a second IBV11-A is needed. When a second board can be obtained the user must inform the diagnostic to exercise the logic on the one IBV11-A that requires a known good module. The signals "SRQ", "ERI", BIAKI" "DA11" AND "ER11HB" are not tested if a known good module is not used.

VDVCB0 11/23 IBV11-A Diagnostic: the description and explanation for this diagnostic is the same as that of "DVKAEB".

ZKRJE0 RK11 Basic Logic Test: The RK11 logic test consists of a series of tests aimed at checking the basic logic of the RK11 controller. This test is also compatible to the Plessey disk controller.

ZRKKF0 RK11 Basic Logic Test Part II: This logic test checks the hardware that the first test could not. When used in conjunction with a drive it is also capable of detecting faults in the drive.

ZRKLE0 RK11/RK05 Dynamic Test: The RK11/RK05 Dynamic Test aims at:

1) Demonstrating the electromechanical integrity of the drive.

2) Checking the linear positioner control and speed control.

3) Verifying the integrity of the read/write logic.

4) Providing a timer for the seek function.

This test is one level higher than the logic test.

ZRKHG0 RK11/RK05 Performance Exerciser: The RK11/RK05 performance exerciser is a high level exerciser program aimed at simulating a RK11/RK05 system environment and checking for errors that arise in such an environment (interaction, polling, etc). It also provides a means of evaluating a system through error logging and data-transfer logging facilities.

THE FOLLOWING IS A LIST OF EACH 2290 DIAGNOSTIC THAT IS RUN AND A BRIEF DESCRIPTION OF EACH.

FKAACO 11/34 Basic Instruction Test: This diagnostic program is designed to be a comprehensive check of the 11/34 processor logic and microcode for all instructions except the trap and memory management instructions. The program does not test instructions or hardware related to the trap or interrupt mechanisms of the 11/34 (E.G. RTT,RTI,WAIT,RESET).

FKABCO 11/34 Traps Test: This is a test of all operations and instructions that cause traps. Also tested are trap overflow conditions, oddities of register 6, interrupts, the reset and wait instructions.

FKACAO 11/34 Extended Instruction Set Test: this diagnostic program tests the 11/34 extended instruction set <ASH, ASHC, MUL, and DIV>, using registers 0-5 at least once with each instruction.

ZM9BCO M9312 Boot Board Test: This diagnostic verifies the ROM information for the M9312 bootstrap terminator. It has two modes of operation; stand-alone mode which requires operator intervention and apt mode. (refer to chapter 4)

CMFAFO MS11,MF11,MA11-P Memory Test: This program locates the parity memory registers for both the core and mos parity and performs a check of the bits in each. It then creates a map showing the memory controlled by each parity register. The parity registers and the memory are then tested using the information in the map.

FKTHBO 11/34 Memory Management Test: This program tests by the "bottom up" approach starting with the smallest segment of memory management logic possible and building to cover all of the logic. The diagnostic will provide enough information such that by deduction, the failure can be isolated to a small segment of the memory management logic.

ZDLDCO DL11-W Diagnostic: This diagnostic is a logic test to verify the operation of the DL11-W serial line/real time clock interface. The program will run without any special test fixtures by default.

ZDZAE0 DZ-11 8 Line Async MUX Test: The function of the DZ-11 diagnostic is to verify the board operates according to the specifications and functions in a system environment. First it determines the device address and the vectors to determine if it is EIA or 20MA, then runs in an echo mode to check the interface. This does not check the device it is connected to. (IE VT-100 SELF TEST)

ZQMCF0 0-124K Memory Exerciser 16K Intervals: This program has the ability to test memory from address 000000 to 757777. It does so using:

A. Unique addressing techniques
B. Worse case noise patterns, and
C. Instruction execution throughout memory

ZRKJE0 RK11 Basic Logic Test: The RK11 logic test consists of a series of tests aimed at checking the basic logic of the RK11 controller. This test is also compatible to the plessey disk controller.

ZRKKF0 RK11 Basic Logic Test Part II: This logic test checks the hardware that the first test could not. When used in conjunction with a drive it is also capable of detecting faults in the drive.

ZRKLE0 RK11/RK05 Dynamic Test: The RK11/RK05 dynamic test aims at:

1) Demonstrating the electromechanical integrity of the drive.
2) Checking the linear positioner control and speed control.
3) Verifying the integrity of the read/write logic.
4) Providing a timer for the seek function.

This test is one level higher than the logic test.

ZRKHF0 RK11/RK05 Performance Exerciser: The RK11/RK05 Performance exerciser is a high level exerciser program aimed at simulating a RK11/RK05 system environment and checking for errors that arise in such an environment (interaction, polling, EIC). It also provides a means of evaluating a system through error logging and data-transfer logging facilities.

INTRODUCTION-This section of the diagnostics manual contains: explicit instructions pertaining to the Set-Up, Running, Re-establishment, and in some cases the expected results of the diagnostic programs for the 2270 and 2290.

PART A 2270 DIAGNOSTICS

3.0 Set-Up

Set the CDC "hawk" drive to boot from the removable cartridge. Insert the XXDP+ disk in the drive. Turn on the power and boot up the disk. (Insure S1 on the 4720 host board is in the up position, to enable ODT).

The system should boot up in about 50 seconds and the console device should display:

```
CLEARING MEMORY
GRDKA0 XXDP+ DK MONITOR 28K
BOOTED VIA UNIT 0

THE FOLLOWING QUESTIONS MAY BE ANSWERED BY DEFAULT
SIMPLY BY TYPING <CR>

ENTER DATE (DD-MMM-YY)  <CR>

RESTART ADDR:153726

LSI?    N  <CR>
```

The console will then display:

```
GRXXDP, A MODIFIED VERSION OF DEC XXDP+

.
```

(.) indicates system ready to accept diagnostic programs.

For LSI 11/02 perform sections 3.1 to 3.5

For LSI 11/23 perform sections 3.6 to 3.8

3.1 LSI-11/02 PROCESSOR BASIC INSTRUCTION TEST

On the console device type:

```
R DVKAAA  <CR>
```

This will start the diagnostic.
After each successful pass of the diagnostic
(about 5 seconds per pass)
the console device will display:

```
END PASS    n
```

Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

```
153726G
```

3.2 LSI-11/02 EIS TEST

On the console device type:

```
R DVKABA <CR>
```

This will start the diagnostic.
After each successful pass of the diagnostic
(about 5 seconds per pass)
the console device will display:

```
END PASS    n
```

Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

```
153726G
```

3.3 LSI-11/02 FIS TEST

On the console device type:

```
R DVKACC  <CR> <CR>
```

This will start the diagnostic.
After each successful pass of the diagnostic
  (about 2 seconds per pass)
the console device will diaplay:

        END PASS n

Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

        153726G

3.4 LSI-11/02 TRAPS TEST

On the console device type:

        R DVKADC <CR>

This will start the diagnostic.
After each successful pass of the diagnostic
  (about 35 seconds per pass)
the console will display:

        END PASS   n

Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

        153726G

3.5 LSI-11/02 MOS MEMORY TEST

On the console device type:

        R DZKMAE <CR>

This will start the diagnostic.
The console device will display:

        DZKMA-D
        000000-167776

The diagnostic is now running and will test each 4K memory bank from 0-6, and the 2K of bank 7.
After the banks 0-7 have been completed the console device will display:

```
TST13 BANK 0X (SEVEN TIMES WITH
   X GOING FROM 0 TO 6)
```

The console device will then display:

```
RELOC
```

Bank 00 will be retested as the diagnostic relocates itself.
The console device will then display:

```
END PASS   n
```

(running time is about 15 minutes)

Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program depress the initialize button and reboot the system.

3.6 LSI-11/23 CPU TEST

On the console device type:

```
R  JKDBB0 <CR>
```

This will start the diagnostic.
The console will display:

```
CJKDB-B  DCF11-AA  CPU DIAG.
```

After each successful pass of the diagnostic (about 15 seconds per pass) the console will display:

```
END PASS    n
```

Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

```
153726G
```

3.7 LSI-11/23 MMU TEST

On the console device type:

```
R JKDAB0 <CR>
```

The console will display:

```
MD-11-CJKDA-B  KTF11-AA MMU DIAG.
SWR=000000     NEW=
TYPE <CR>
```

This will start the diagnostic.

The console will display:

```
END PASS   n; total errors since last start at 200 = 0
```
(about 15 seconds per pass)

Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

```
153726G
```

3.8 LSI-11/23 128K MEMORY TEST

On the console device type:

```
R ZKMAF1 <CR>
```

This will start the diagnostic.
The console will display:

```
CZKMAF0

000000-757776   (IMMEDIATELY)
TST13  BNK  00
                (AFTER SEVERAL MINUTES)


          06
RELOC
TST13  BNK  00  (DELAYED SEQUENTIAL DISPLAY)
TST13  BNK  07
```

```
TST13  BNK  30
END PASS    01
  (about 34 minutes per pass)
```
Allow a minimum of 2 passes and then depress <ESC> <RESET>.
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program depress the initialize button and reboot the system.

3.9 LSI-11/23 128K MEMORY EXERCISER

* THIS TEST WILL TAKE ABOUT 14 HRS AND 20 MINUTES TO RUN.

On the console device type:

```
L ZKMAF1 <CR>
```

Then type: <ESC> <RESET>
Then type: 176/
The console device will display:

```
        000 176    010000
Type:  10200 <CR>
Type:  200G
```

What the console displays now will be similar to that of the previous test.

After 1 pass is completed type: <ESC> <RESET>
The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program depress the initialize button and reboot the system.

3.10 DISPLAY TEST

Key in the following command string to load and run the terminal board test:

```
.R ZICDCA <CR>
```

The program will come up with a header page which allows you to run the tests separately or sequentially. Hit any key on the GR keyboard to continue.

3.10.1 THE DISPLAY SHOULD INDICATE THE FOLLOWING:

```
There were no register time out failures
The console device pretests passed
Please type a character on the keyboard
```

Type a character on the keyboard. The display should print:

```
Please type another character on the keyboard
```

Type another character on the keyboard. The display should print:

```
There were no read write failures
```

3.10.2 AFTER A SHORT DELAY THE TERMINAL WILL START DISPLAYING A PRECESSING SCROLLING CHARACTER SET.

Hit the spacebar. You should notice that the display intensity increases. Hit the spacebar again and the display should return to normal. Continue pressing the spacebar and note the following sequence of attributes. If all of them do not occur or are in the wrong order there is a failure.

```
INVERSE VIDEO
NORMAL
BLINKING
NORMAL
UNDERLINE 8 ON
UNDERLINE 9 ON
UNDERLINE BLINK ON
UNDERLINE 9 OFF
UNDERLINE BLINK OFF
UNDERLINE 8 OFF
```

```
DISABLE SCROLL ON          (bottom line moving only)

                           NOTE: AT THIS TIME CHECK THE
                           CHARACTERS FOR PROPER FORMATION.
                           HIT THE SPACEBAR AGAIN.
```

DISABLE SCROLL OFF
DOUBLEWIDTH ON
DOUBLEWIDTH OFF

3.10.3 After a short delay the screen will contain all X's. Verify that an X is in each location by counting 24 lines. In this section you will repeatedly press the spacebar and note that all the X's have the same attributes. If some locations don't have the same attributes a failure has most probably occurred in the attribute ram. You should see the following sequence of displays:

INTENSE VIDEO
NORMAL
INVERSE VIDEO
NORMAL
BLINKING
NORMAL
UNDERLINE 8 ON (ONE RASTER LINE ABOVE THE BOTTOM OF CURSOR)
UNDERLINE 9 ON (SAME RASTER LINE AS THE BOTTOM OF CURSOR)
UNDERLINE BLINK ON
UNDERLINE 9 OFF
UNDERLINE BLINK OFF
BLANK SCREEN (CURSOR ONLY)
ROW OF X'S (AT THE BOTTOM OF THE SCREEN)
NORMAL (FULL SCREEN OF X'S)
DOUBLEWIDTH ON
NORMAL

PRESS THE SPACEBAR AGAIN FOR THE NEXT SECTION.

3.10.4 KEYBOARD TEST

The display will print:

PLEASE KEY IN A "SHIFT A"

The display will print the character received and then print:

PLEASE KEY IN A "SHIFT B"

The display will print the character received and then print:

PLEASE KEY IN A "SHIFT D"

The display will print the character received and then print:

PLEASE KEY IN A "SHIFT H"

The display will print the character received and then print:

PLEASE KEY IN A "SHIFT P"

The display will print the character received and then print:

PLEASE HIT THE SPACEBAR

The display will print the character received and then print:

PLEASE KEY IN A "="

NOTE: YOU WILL NOT SEE A SPACE!

If the test is successful the display will then move onto the next section and graphically display 2 keypads.

3.10.5 KEYPAD TEST

The display should be displaying a left and right keypad. Insert a keypad cable into the left keypad connector on the 2270.

Press the start/continue button on the keypad. The displayed keypad will blink the start/continue location and the fail light will turn inverse video indicating that the keypad fail led should be on. Press the start/continue button several times and make sure that thekeypad led's are in phase with those on the display.

Now press the other keypad keys in sequence and make sure that the corresponding displayed keypad switches blink in turn.

Move the keypad to the righthand keypad connector on the 2270 and repeat the above test making sure that the

righthand keypad display is activated.

Type a control-C to terminate this test.

3.10.6 PROCESSOR HALT TEST

The monitor should now display:

```
CONSOLE DEVICE TEST COMPLETE
PLEASE ENTER ONE OF THE FOLLOWING:
CONTROL-Z --TO RESTART TEST PROGRAM
CONTROL-C --TO ENTER THE MANUAL MODE
CONTROL-X --TO EXIT THE PROGRAM
```

Type control-C. This will put you in the manual mode and its display page. Make sure that S1 on the host board (2266-4720) is in the up position. Hit the ESC key on the GR keyboard. The screen will be replotted. Now hit the reset key on the GR keyboard. You will now see:

```
XXXXXX      (SOME NUMBER BETWEEN 44344 AND
@            44352)
```

Now type P <CR>. The display will again be replotted. This indicates that the processor halt function is working properly. Now type control-C

This completes what will be done with this test at this time. Type: cntr'l X the system will reboot.

3.11 LSI-11/02-11/23 IEEE488 OPTION TEST

On the console device type:

```
R  DVKIBC <CR>
```

After first successful pass (about 5 seconds) console displays

```
END PASS 1.
```

The diagnostic is now looping 2000 times. After 30 seconds console will display:

```
        END PASS 2
```

Allow a minimum of 2 loop passes. Then depress <ESC> <RESET>. The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

```
        153726G
```

3.12 CDC "HAWK" DISK AND DYNUS CONTROLLER TEST

NOTE: THIS TEST SHOULD BE RUN ONLY AFTER THE DRIVE HEAD ALIGNMENT CHECK AND INDEX TO BURST ADJUSTMENT HAVE BEEN COMPLETED.

NOTE: ALL INFORMATION ON DK1:,2 AND 3 WILL BE DESTROYED UPON EXECUTION OF THIS TEST.

On the console device type:

```
        C RKTEST
```

*****NOTE*****

If your system contains an LSI-11/23 with 128K of memory, you will get the following error message during RK11 Logic Test 2:

```
'ERR BIT' DIDN'T SET IN RKER
  PC     RKCS     RKER   ERR BIT
015676 100266   000001   002000


  HE  OR  ERR DIDN'T SET
    PC      RKCS     RKER
015712      100266   000001
```

If you get this error, ignore it! The reason this test fails is because the diagnostic is checking the controller's ability to detect nonexistent memory, however memory exists everywhere!

The diagnostic type out will be as follows as the four disk/controller diagnostics run:

```
R ZRKJE0/2

RK11 LOGIC TEST 1                    (RUN TIME IS 1 MINUTE)
MAINDEC-11-DZRKJ-E                    PER PASS.

END PASS
R ZRKKF0/1

RK11 LOGIC TEST 2                    (RUN TIME IS 6 TO 10 MINUTES)
MAINDEC-11-CZRKKF                     PER PASS.

NOT TESTING DRIVE 0
DRIVES PRESENT
000000
000001
000002
000003
DRIVE 1

DRIVE 2

DRIVE 3

END PASS          1
R ZRKLE0/1

RK11 DYNAMIC TEST                    (RUN TIME IS 15 TO 20 MINUTES)
MAINDEC-11-DZRKL-E                    PER PASS.

NOT TESTING DRIVE 0
DRIVES PRESENT
1
2
3
DRIVE 1
DRIVE 2
DRIVE 3

END PASS          1
```

```
R ZRKHG0/1

RK11/RK05 PERFORMANCE EXERCISER (RUN TIME IS 30 TO 90 MINUTES)
MAINDEC-11-DZRKH-G                    PER PASS.

NOT TESTING DRIVE 0
DRIVE, IF, 2F, 3F

END OF PASS      1
DRIVE   WRDS    WRITN   WRDS  READ     CSE     SCE  DATERR     HE
1               18555     17033          0       0       0      0
2               38990     37451          0       0       0      0
3               15552     14564          0       0       0      0
DRIVE        SKE     ABORT     SIN
1              0         0       0
2              0         0       0
3              0         0       0
```

THE FOLLOWING COLUMNS SHOULD ALL BE ZEROES: CSE, SCE, DATERR, HE, SKE, ABORT, SIN. IF THE COLUMNS ARE NOT ALL ZEROES, THE DRIVE OR THE CONTROLLER IS BAD.

THE RKTEST PROGRAM WILL RESPOND WITH A DOT (.) WHEN COMPLETED.

3.13 DATA RELIABILITY AND DRIVE INTEGRITY

NOTE: Running this test will destroy all information on all disk surfaces.

On the console device type:

```
L ZRKHG0 <CR>
```

Spin down the XXDP+ disk and remove it. Let out the write-protect switches.

Get a scratch disk that has been formatted in a known-good drive. Spin it up in your drive.

Clear memory location 40 by the following method: type

<ESC> <RESET>

The LSI-11 will go into console ODT mode. Console ODT will respond:

```
XXXXXX
@
```

where the X's stand for octal digits. Now type:

```
40/
```

and console ODT will put six more octal digits on the screen, representing the contents of location 40. Type:

```
0<CR>
```

to clear location 40. Console ODT will respond with a carriage return - line feed and another @ symbol.

Now type:

```
200G
```

to start the program. The program will output

```
SWR = 000000    NEW =
```

and wait. Type <CR> to make the program continue.

Let the drive run for 12 hours. Then check that the status report on the screen shows all zeroes in the following columns:

CSE, SCE, DATERR, HE, SKE, ABORT, SIN. If the columns are not all zeroes, the drive or the controller is bad.

3.14 LSI-11/02 QAFC TEST

On the console device type:

```
R ZPQAOC    [JPQACB FOR 11/23]
```

The console will display several questions to be answered by the user. Responses are made by typing Y (yes) or N (no) followed by <CR>.

After completion of test, depress <ESC> <RESET>. The program will halt and display "@" the ODT prompt.

To re-establish the system for the next program type:

153726G

STRIP PRINTER INTERFACE TEST

Check the following before proceeding with the test:

that the jumper (J1) is installed in the (4709) board in slot 1 of the I/O cage.

that the strip printer has paper loaded.

that the strip printer power and select switches are in the "on" position.

Turn system power on and boot the diagnostic disk.

Load the strip printer test program by typing the following on the console device:

R ZISP0A <CR> for 11/02

R JISPCA <CR> for 11/23

The program should begin execution automatically and halt after one complete pass. The strip printer will print messages indicating what functions it will be performing.

To repeat the test depress any key on the console keyboard except <cntrl> C which will cause the system to halt in the console ODT mode.

After completion of the test, run down the disk drive and turn off the system power.

CLOCK TIMER BOARD TEST

With the system powered down, install the clock board on an extender board.

Check that:

The battery voltage is at least 3.0 volts and that there are no signs of leakage or corrosion.

There is a wire-wrap jumper installed between IP "clock" and IP "64".

Jumper J5 has been installed.

Remove the fuse from FIX and install it in F1.

Power up the system and boot the diagnostic disk.

Put the write/protect switch on the clock board to the write position.

Load the clock test program by typing the following on the console keyboard:

R ZIRTCC <CR> FOR 11/02

R JIRTCC <CR> FOR 11/23

If the program runs successfully (note 1,) connect a counter between U17-Pin 5 and ground. Tweak C2 for a reading within the limits shown below, (note 2).

	PERIOD	FREQUENCY
MAX	30.516434uS	32,767.298 Hz
NOM	30.517578uS	32,768 Hz
MIN	30.518723uS	32,768.702 Hz

NOTE 1. If test fails particularly at Test 26, check that write/protect switch is in the write position and that S1 on ALL Kramden boards are in the normal position.

NOTE 2. Higher accuracy can be achieved by measuring the period rather than the frequency.

Run down the diagnostic disk and turn off the system power. Install the clock board in the system and return power.

RELAY GROUND DRIVER TEST

Load the diagnostic disk and start the program by typing the following on the console keyboard:

R ZMRGCB <CR> FOR 11/02

R JMRGCA <CR> FOR 11/23

The program will begin. At this time the user can observe the LED's on the relay ground board (under the receiver) blinking at a 1 Hz rate, and hearing the relays turn on and off.

To terminate the test type <ESC> <RESET>.

To re-establish the system for the next program type:

153726G

MEASUREMENT MODULE TESTS

To calibrate and verify the following measurement modules refer to the "MIN CAL" portion of this manual.

AC IMPEDANCE MEASUREMENT MODULE

ZMACRG.BIN

This program calibrates (limited) and verifies accuracy of ACZ (4708) for both (11/02) and (11/23).

DC SOURCE MODULE

ZMDSRG.BIN

This program calibrates and verifies accuracy of DC source (4711) for both (11/02) and (11/23).

DC MEASUREMENT MODULE

ZMDMRG.BIN

This program calibrates and verifies accuracy of DC measure (4712) for both (11/02) and (11/23).

The remaining modules in the measure and scanner cages are tested and verified at this level by utilizing the existing programs on the system OVP disk.

MODULE	LOCATION	TEST METHOD
MUX	M 32(MAN) 31(OPT) 30(OPT)	WITH KNOWN GOOD BOARD IN SLOT 32 AND BOARD TO BE TESTED IN SLOT 31, RUN OVP MUX (n)10 (N = VERSION AVAILABLE) REPLY OPTION 1 TO DISPLAY.
RELAY DRIVER	M 2 M 3	WITH KNOWN GOOD BOARD IN SLOT 2 AND BOARD TO BE TESTED IN SLOT 3, RUN OVP PIO(n)10 (N = VERSION AVAILABLE)
SCANNER SCN 1-X		RUN OVP SCN RLY(n)10 (N = VERSION AVAILABLE)

DRIVER/SENSOR REFERENCE CALIBRATION AND VERIFICATION

ZDRFRG.BIN

This program calibrates and verifies the accuracy of the D/S Reference Board (4705) for both (11/02) and (11/23) and all digital configurations.

For further instructions concerning this program, refer to the "MIN CAL" portion of this manual.

DRIVER/SENSOR CONTROLLER BOARD TEST

Install the D/S controller board into its assigned slot.

NOTE - THE D/S CONTROLLER BOARD WILL ALWAYS BE INSTALLED IN THE LOWER CAGE EXCEPT FOR SYSTEM CONFIGURATION 7.8 (BIG DIGITAL WITH PURE PINS).

Install the known good D/S board into the first available D/S slot.

Install the 2270-XXDP+ disk into the disk drive.

Turn the 2270 system power on, then spin-up the disk drive to boot to the XXDP+ monitor.

Key in the following command string (after the period) to load and run the D/S controller test program.

.R ZDCIOC <CR> FOR 11/02

.R JDCICA <CR> FOR 11/23

THE SELECTED DISPLAY TERMINAL SHOULD RESPOND WITH THE FOLLOWING MESSAGE.

```
**************************************************************

        D/S CONTROLLER BOARD DIAGNOSTIC

      KEYBOARD CONTROLS WHICH ARE OPERATIONAL:
      <CTRL> C - ABORTS TASK AND RETURNS TO MONITOR
      <CTRL> O - ABORTS TASK AND EXITS TO ODT
      <CTRL> Z - RESTARTS PROGRAM
      <CTRL> S - TEMPORARILY HALTS PROGRAM EXECUTION
      <CTRL> Q - RESUMES EXECUTION AFTER <CTRL>S

        CAP  G - TURN ON/OFF DISPLAY FOR PRINTING
        CAP  L - TURN ON/OFF LINE PRINTER FOR PRINTING
        CAP  S - TURN ON/OFF STRIP PRINTER FOR PRINTING
      DEFAULT FOR PRINTING  G - ON, L - OFF, S - OFF
      ALL OTHER KEYCODES IGNORED.     HH:MM:SS


ENTER SLOT NUMBER OF THE FIRST D/S BOARD TO BE TESTED:
**************************************************************
```

ENTER THE BOARD NUMBER OF THE KNOWN GOOD D/S BOARD

(NORMALLY 1), THEN TYPE A CARRIAGE RETURN (<CR>).
THE PROGRAM WILL THEN RESPOND WITH THE NEXT
REQUEST:

ENTER SLOT NUMBER OF THE LAST D/S BOARD TO BE TESTED:

AFTER ENTERING THE BOARD NUMBER OF THE KNOWN GOOD
D/S BOARD FOLLOWED BY A <CR>, THE PROGRAM WILL
BEGIN EXECUTION AUTOMATICALLY AND CONTINUE
LOOPING INDEFINITELY. AN END OF PASS MESSAGE
IS PRINTED INDICATING THE PASS COUNT AND
SYSTEM TIME

D/S TEST - END OF PASS XX HH:MM:SS

Allow program to run several passes before discontinuing.

When complete, spin down disk and turn system power off.

Remove the known good D/S board from the system.

SLAVE CONTROLLER BOARD TEST (2266-4719)

Install the slave controller board into its assigned slot.

NOTE - DO NOT PROCEED WITH THIS SECTION UNTIL THE
SUCCESSFULL COMPLETION OF THE MAIN D/S
CONTROLLER BOARD.

Install the known good D/S board into the first available
D/S slot in the D/S cage (board slot 31 is the normal slot).

Install the 2270 XXDP+ disk into the disk drive.

Turn the 2270 system power on, then spin-up the disk drive
to boot to the XXDP+ monitor.

Type in the following command string (after the period) to
load and run the slave controller test program:

R ZDCTOC <CR> FOR 11/02

R JDCTCA <CR> FOR 11/23

THE SELECTED DISPLAY TERMINAL SHOULD RESPOND WITH THE FOLLOWING MESSAGE:

```
**********************************************************************
                D/S CONTROLLER BOARD DIAGNOSTIC

        KEYBOARD CONTROLS WHICH ARE OPERATIONAL:
        <CTRL> C - ABORTS TASK AND RETURNS TO MONITOR
        <CTRL> O - ABORTS TASK AND EXITS TO ODT
        <CTRL> Z - RESTARTS PROGRAM
        <CTRL> S - TEMPORARILY HALTS PROGRAM EXECUTION
        <CTRL> Q - RESUMES EXECUTION AFTER <CTRL> S

          CAP  G - TURN ON/OFF DISPLAY FOR PRINTING
          CAP  L - TURN ON/OFF LINE PRINTER FOR PRINTING
          CAP  S - TURN ON/OFF STRIP PRINTER FOR PRINTING
        DEFAULT FOR PRINTING  G - ON, L - OFF, S - OFF
        ALL OTHER KEYCODES IGNORED.     HH:MM:SS


ENTER SLOT NUMBER OF THE FIRST D/S BOARD TO BE TESTED:
**********************************************************
```

ENTER THE BOARD NUMBER OF THE KNOWN GOOD D/S BOARD (NORMALLY 31), THEN A CARRIAGE RETURN (<CR>). THE PROGRAM WILL THEN RESPOND WITH THE FOLLOWING QUESTION:

```
ENTER SLOT NUMBER OF LAST D/S BOARD TO BE TESTED:
```

AFTER ENTERING BOARD NUMBER OF THE KNOWN GOOD BOARD THE PROGRAM WILL BEGIN EXECUTION AUTOMATICALLY AND CONTINUE LOOPING INDEFINITELY. AN END OF PASS MESSAGE IS PRINTED INDICATING THE PASS COUNT AND SYSTEM TIME.

```
D/S TEST - END OF PASS XX          HH:MM:SS
```

Allow program to run several passes before discontinuing.

When complete, spin down disk and turn system power off.

Remove the known good D/S board from the system, and proceed with the next section.

DRIVER/SENSOR BOARD TEST (2266-4706)

Install no more than five (5) D/S boards (2266-4706) into the first D/S slots.

Install the 2270 XXDP+ disk into the disk drive.

Turn the 2270 system power on, then spin-up the disk drive to boot to the XXDP+ monitor.

Type in the following command string (after the period) to load and run the D/S diagnostic test program.

.R ZDDSOJ <CR> FOR 11/02

.R JDDSCA <CR> FOR 11/23

The selected display terminal should respond with the following message:

```
**************************************************************************
                D/S SYSTEM DIAGNOSTIC

KEYBOARD CONTROLS WHICH ARE OPERATIONAL:
<CTRL> C - ABORTS TASK AND RETURNS TO MONITOR
<CTRL> O - ABORTS TASK AND EXITS TO ODT
<CTRL> Z - RESTARTS PROGRAM
<CTRL> S - TEMPORARILY HALTS PROGRAM EXECUTION
<CTRL> Q - RESUMES EXECUTION AFTER <CTRL> S

  CAP  G - TURN ON/OFF DISPLAY FOR PRINTING
  CAP  L - TURN ON/OFF LINE PRINTER FOR PRINTING
  CAP  S - TURN ON/OFF STRIP PRINTER FOR PRINTING
DEFAULT FOR PRINTING  G - ON, L - OFF, S - OFF
ALL OTHER KEYCODES IGNORED.      HH:MM:SS
```

ENTER SLOT NUMBER OF FIRST D/S BOARD TO BE TESTED :
****

ENTER THE DECIMAL SLOT NUMBER OF THE FIRST D/S BOARD TO BE TESTED. IN A PURE PIN SYSTEM THE NUMBER IS TYPICALLY ONE MORE THAN THE NUMBER OF ANALOG SLOTS IN THE SYSTEM. IN A HYBRID PIN SYSTEM THIS NUMBER SHOULD BE THE NUMBER ONE (1).

THE PROGRAM WILL THEN PRINT OUT THE FOLLOWING MESSAGE :

ENTER SLOT NUMBER OF THE LAST D/S BOARD TO BE TESTED :

ENTER THE DECIMAL SLOT NUMBER OF THE LAST D/S BOARD TO BE TESTED. NOTE, THAT THERE CAN NOT BE ANY PHYSICAL OR ELECTRICAL GAP BETWEEN THE FIRST AND LAST ENTRIES. HOWEVER, ANY SINGLE OR GROUP OF D/S BOARDS CAN BE TESTED BY SIMPLY ENTERING THE APPROPRIATE NUMBERS.

THE PROGRAM WILL THEN VALIDATE YOUR ENTRIES AND PROCEED AUTOMATICALLY WITH DIAGNOSTIC TEST EXECUTION. IF YOUR ENTRIES ARE FOUND TO BE INVALID AN ERROR MESSAGE WILL BE DISPLAYED, INDICATING THE FIRST AND LAST BOARD RECOGNIZED BY THE PROGRAM. YOU WILL THEN BE ASKED TO RE-ENTER NUMBERS FOR THE FIRST AND LAST BOARD.

ONCE STARTED THE PROGRAM WILL CONTINUOUSLY CYCLE THROUGH ALL THE DIAGNOSTIC TEST. AT THE END OF EACH PASS, AN END OF PASS MESSAGE IS DISPLAYED INDICATING THE PASS COUNT AND SYSTEM TIME.

NOTE - THIS PROGRAM, AT PRESENT, DOES NOT ALLOW THE BENEFIT OF MANUAL TROUBLESHOOTING. DO NOT ATTEMPT TO CLEAR ALL ERROR MESSAGES AT THIS TIME. ATTEMPTS SHOULD BE MADE TO CLEAR ONLY THOSE ERRORS THAT DISABLE THE BOARD AND/OR D/S SYSTEM.

Allow program to run for several pases before continuing.

Stop test program execution by typing <CTRL> C, then spin-down disk and turn 2270 system power off.

Install the remaining d/s boards for the first cage only, and repeat test, then continue below.

If the system is a BIG D, install all of the remaining boards and repeat test.

This completes the first phase of D/S checkout

PART B 2290 DIAGNOSTICS

SET-UP

A 2290 console device may be, a DECWRITER or a VT100, depending on the individual system configuration.

Insert the XXDP+ disk in the lower drive. Turn on the power and depress the boot button.

The DECWRITER will then respond with the contents of the CPU registers. ie:

```
XXXXXX   XXXXXX   XXXXXX   XXXXXX
@
```

The user should now respond on the console device by typing:

```
DK2 <CR>
```

The console device will reply with:

```
Clearing memory
GRDKA0 XXDP+ DK monitor 28K
booted via unit 2.
```

The following questions may be answered followed by <CR>

The console device will then respond with:

```
GRXXDP, a modified version of DEC XXDP+
.
```

(.) indicates system ready to accept diagnostic programs.

2290 VERIFICATION

This program, in chain file form, verifies the processor and most of the options in the 2290.

On the console device type:

```
C USERCK <CR>
```

The console device will respond with:

```
L FKAAC0
```

To continue press control and continue simultaneously:

```
S 176/5
```

At this time the user should depress the control and continue keys on the control panel of the 11/34 simultaneously.

```
R FKABC0/5
R FKACA0/5
R ZM9BC0/3
R CMFAF0/3
R FKTHB0/3
R ZDLDC0/3
R ZDZAE0/3
```

The chain program will execute at this time printing the results as it progresses, terminating with:

```
"END"
.
```

Any of these programs may be run individually, according to the users diagnostic needs, as correlated to the programs description by typing:

```
R filename <CR>
```

11/34 0-124K MEMORY EXERCISER (OPTIONAL)

If further memory diagnosis is needed, the user should type the following on the console device:

R ZQMCF0 <CR>

The program will begin (approx. 3 min/16K memory). Upon completion the console device will respond with:

END PASS n

Allow time for a minimum of two passes. Then simultaneously depress:

the contr'l and halt keys, located on the PDP 11/34 control panel.

To re-establish the system for the next program, on the PDP 11/34 control panel, depress 153726 and LAD then simultaneously depress contr'l and start.

LA 36 DECWRITER TEST (OPTIONAL)

This test will exercise the DECWRITER. The user should type the following on the console device:

R ZLACF0 <CR>

The program will execute and proceed to printout a series of 12 tests numbered in octal (approx 6 mins.).

Allow time for two complete passes, then simultaneously depress the contr'l and halt keys, located on the PDP 11/34 control panel.

To re-estabish the system for the next program, on the PDP 11/34 control panel, depress 153726 and LAD keys, then simultaneously depress contr'l and start.

LINE PRINTER TEST (OPTIONAL)

This test will exercise the Printronix line printer. The user should type:

```
R ZLPAB1 <CR>
```

This will execute the test, and respond question and instructions to the user. The program will conclude by typing (on the console device):

```
"END"
.
```

DISK DRIVE AND CONTROLLER TEST

****

WARNING - RUNNING THIS TEST WILL DESTROY ALL
INFORMATION ON ALL SYSTEM DISK
SURFACES EXCEPT THE DIAGNOSTIC SURFACE

****

If the user is to use this test; on the console device type:

C DISKCK <CR>

The console device will respond with:

L ZRKJE0

To continue press control and continue simultaneously.

S 176/2

At this time the user should depress the control and continue keys on the control panel of the 11/34 simultaneously.

R ZRKKF0/2
R ZRKLE0/2
R ZRKHG0/2

The chain program will execute at this time printing the results as it progresses, terminating with:

"END"

.

This concludes the 2290 Diagnostics.

For further information pertaining to the 2290 diagnostics the user should refer to 2290-0108 and 2290-0109 manuals received with the system package.

APPENDIX

Hard Copy Directory (2270)
Hard Copy Directory (2290)
Help Text (2270)
Disk Pack Formatter and Surface Verifier (2270)
Manual Disk Boot (2270)
Manual Disk Boot From Any Drive
Manual Floppy Diskette Boot (2270)
XXDP+ Monitor
Update
Floppy Drive System Test

DIRECTORY HARD COPY (2270)

After booting the XXDP+ disk and console displays (.), type P/n,

where n =

0	standard Dec device
1	strip printer 11/02
2	line printer 11/02
3	strip printer 11/23
4	line printer 11/23

The console will again display (.), then type D/L and the directory will be hard copied to the chosen device.

DIRECTORY HARD COPY (2290)

After booting the XXDP+ disk, the console device will print (.), at this time type DIR DK0:<CR>. The directory will be output to the DECWRITER LA-36.

HELP TEXT HARD COPY (2270)

After booting the XXDP+ disk, and performing the P/n operation, type R UPD2, the console will display (*), now type: Print DK0: HELP.TXT <CR>. The help file will be printed on the chosen device.

DISK PACK FORMATTER AND SURFACE VERIFIER.

The 5440 media disk pack as it is received from stock may not be formatted.

To format the disk and verify that there are no bad blocks a RK11 utility program is run under XXDP+ UPDATE 2.

On a 2270 system install a XXDP+ Disk and boot the system Write protect the fixed disk, if formatting the removable cartridge media.

Write protect the cartridge, if formatting the fixed media.

Enter the Update 2 program as follows:

R UPD2 <CR>

Load the RK11 utilities program as follows:

Load DK0:ZRKIF0.BIN <CR>

If the removable cartridge disk is being formatted spin down the disk, and install the disk to be formatted.

Start the RK11 utility program as follows:

Start 200 <CR>

The program will display:

SWR = 000000 NEW =

Hit carriage return <CR>.

The utility program will display a list of the options available.

Select type 3, "FORMATTER SURFACE VERIFIER"

The program will then display:

SWR = 000000 NEW =

The number entered here tells the program which drives to format.

DRIVE	SWR
0	1
1	2
2	4
3	10
0 + 1	3
2 + 3	14
0,1,2+3	17

If the 2270 system is configured for logical drives 0 and 1 to be on the top removable media, enter

NEW = 3

The program will start with drive 0 and format that drive first. If there are no errors it will display:

PACK GOOD

and continue to drive 1.

If drive 1 is also good, then the disk pack has been formatted and verified.

To get out of program, press initialize.

MANUAL DISK BOOT

If for any reason it is necessary to boot the system disk from the console device the following methods can be used.

Boot to drive 0.

Enter the following code at the console terminal. (Be sure the disk drive is on and spun up to "READY").

```
10000/12737
10002/    5
10004/177404
10006/    1
10000G
```

Halt the CPU by depressing the <ESC> <RESET> keys.

```
@G
```

The system should boot to logical drive 0.

BOOT TO ANY DRIVE.

Use this program to boot an operating system on any drive when the system does not have a boot board or contains a defective boot board.

R0 = drive number in bits 15, 14, and 13.

R0	DRIVE
00000	0
20000	1
40000	2
60000	3

Enter the following program at the console terminal:

```
1000/12701    START:  ;MOV RKCS TO R1
1002/177404
1004/     5           ;RESET
1006/10061
1010/     6
1012/12761            ;LOAD RKWC = -256
1014/177400
1016/     2
1020/12711            ;LOAD RED AND GO
1022/     5
1024/105711     1$    ;TEST READY
1026/100376           ;WAIT FOR READY
1030/5007             ;FORCE PC TO 0.
1000G
```

MANUAL FLOPPY DISKETTE BOOT (2270)

If for any reason it is necessary to boot a 2270 from a floppy diskette, the following method may be used:

Place the floppy diskette into DY0, power-up the system, and then type on the console keyboard <ESC> <RESET>. The console will display "@" the ODT prompt.

Type in the following ODT program:

```
2000/012701
      177170
      012700
      100240
      005002
      012705
      000200
      012704
      000401
      012703
      177172
      030011
      001776
      100440
      012711
      000407
      030011
      001776
      100433
      110413
      000304
      030011
      001776
      110413
      000304
      030011
```

```
2064/001776
      100422
      012711
      000403
      030011
      001776
      100415
      010513
      030011
      001776
      100411
      010213
      060502
      060502
      122424
      120427
      000007
      003737
      005000
      005007
      000000 <CR>
      2000 G
```

The XXDP+ monitor is loaded when the system is booted from a XXDP+ disk.

Loading and running programs.

1) Type "R" and the program name (up to 6 characters). Do not type the extension (.BIN, .BIC). This will load and run the program. To just load the program type "L" and the program name. Once loaded typing a "S" will start the program.

2) If a typing error is made type a "CTRL C" key and a (.) will be typed. Retype "R" and the program name.

3) The desired program is loaded a dot typed, and

   a. The program self starts if it is self starting, or

   b. The program is started at location 20 if the program name was ended with an altmode character, or

   c. The monitor waits for another command. The program must be started manually by typing "S program name<CR>".

4) To load another program after running the previously loaded program, restart the monitor at the restart address.

CHAIN MODE OPERATION

Chain mode operation consists of the sequential execution of programs without operator intervention. Only programs that have been modified to run in chain mode can be chained. Chainable progrms are identified in the directory by the extenions ".BIC". .BIC is a chainable binary file.

To run chain mode, the XXDP+ monitor requires a file indicating the programs to run and the number of passes each program should run.

A chain file may be generated by using the XIECO editor, and the user must put a .CCC extension on the chain file.

To summarize:

1) Chain mode runs chainable programs only. (.BIC extensions).

2) A chain file indicates the programs to run and their pass counts.

3) Only programs located on the same media drive, (logical drive), can be chained.

4) The chain file must be on the same medium with a .CCC extension.

CAUTION:

NOTE

WHEN LOADING DIAGNOSTICS THAT CHECK THE XXDP+ MEDIUM CARE MUST BE TAKEN TO BE SURE THAT THE MEDIUM IS NOT ACCIDENTLY DESTROYED. THE REMOVABLE MEDIA SHOULD ALWAYS BE WRITE PROTECTED.

Chain mode is entered by typing:

C filename<CR> (While in monitor mode).

Where:

C is the chain command.

Filename is the value of the ASCII file that contains the monitor commands to be executed. The file must have a .CCC extension.

```
R UPD2 <CR>                          Load update 2 program
                                     (the . indicates that the
                                      XXDP+ monitor is active
                                      and ready to accent commands.)

DZQUA-I-RKDP Update Program 2   21-JUL-1976

Program relocated to: XXXXXX         Restart address
Restart: XXXXXX

*                                    Ready for keyboard commands.

*Fill <CR>                           The filler count should be
 000014                              set to 1 for TTY

*CLR <CR>                            Clears all memory area to
                                     zero below update prog.

*Load dev: filnam.ext                To load a program which is
                                     in ABS format

XFRADR:  000050   CORE:  000000, 017670

                                     XFRADR: indicates the starting
                                     address of the program loaded.
                                     If it is 1 or ODD, the program
                                     is not self starting.

                                     CORE:  Left number  = the
                                     lowest location.

                                     RIGHT NUMBER = the highest
                                     locaton of the prooram loaded.

                          DEV: = KB: = TTY keyboard or low speed tape reader
                               = PT: = TTY printer and punch
                               = DKN: = RK11 disk   N = 0-3
```

*Dump DKN: FILE.BIN

The memory contents can be written to a XXDP+ medium in ABS format by the dump program. Processing starts from the programs LO core limit and proceeds to but does not include the programs HI core limit.

*XFR <CR>

Request current transfer address. 1 is the current XFR address. New XFR address is entered by the user.

Once a program has been loaded into core by the "LOAD" command it can be made self starting or not self starting. If it is a 1 or ODD it is not self starting.

Diagnostic programs are purposely made not self starting.

*START <CR>

Used to start a self starting program.

*START ADR <CR>

Used to start a program at a specific location.

NOTE: IF THE COMMAND START <CR> IS GIVEN FOR A NON SELF START PROGRAM THE PROCESSOR WILL TRAP OUT WITHOUT AN ERROR MESSAGE.

*SAV RKN: RKDP.SAV

The contents of core are written onto the output device as a single block of data. Starting at location 0 and proceeding to the high limit of the program in core. The only valid extension is .SAV. (core image).

The only current use of the save command is to place a core image of the XXDP+ monitor on disk.

```
*GET DK0:RKDP.SAV
```

The "GET" command placed the saved program into core starting at location 0.

Save (.SAV) core image files are no longer in use. The "GET" command is no longer very useful. It has been left as the compliment of the save command.

```
*MOD 50 <CR>
000050  000005 <CR>
```

Modify address 50
Contents of addr 50 is 5. Type in new contents and <CR> to close address or <LF> to open address +2 for another modification.

The "MOD" command will not allow the user to go beyond the programs protective limits (LO CORE, HI CORE), an "INVCOR" error will occur.

```
*MODALL 177400
177400   000010
```

Same as "MOD" command but allows modification of any location

```
*CORE <CR>
000000, 014776
```

The "CORE" command causes the lower and upper limits of the program in core to be typed.

```
*LOCORE ADR <CR>
```

The "LOCORE" command is used to change the lower limit of the program in core. ADR is the new LO CORE limit. It is recommended that address be even.

```
*HICORE ADR <CR>
```

The "HICORE" command is used to change the upper limit of the program in core. ADR is the new HICORE limit which must be >LOCORE AND < the start of update program.

Typically the "HICORE" command is used to reserve an area for patching a program. The HICORE limit must be set sufficiently high so as to include the complete patch.

*DIR DK0:	This gives an entire directory of DK0:
DIR DK0:.BIN	Gives a directory of all files with an extension of .BIN.
*DIR DK0:*BI?	Gives a directory of all files with an extension of "BI" and any other character.
*DIR DK0:ZIC???.BI?	Gives a directory of all files all with the first three characters of the filename "ZIC" and having an extension beginning with "BI"
*DEL DK0:FILE.EX	Causes the file to be deleted.
*ZERO DK0:	Destroys the directory. This should be done on a brand new disk. When the device being zeroed contains a "BAD SECTOR" track one of the following messages will be output. NBBKS -Disk zeroed contains no detected bad blocks as per bad sector track. BBKS -Disk zeroed contains detected bad blocks as per bad sector track.
*BOOT DK0: <CR>	Causes block 0 of DK0 to be loaded into memory, starting at location 0. Block 0 is assumed to have a boot loader.
*SAVM DK0:	Causes the firsk 4K to be written in .SAV format (core image). This command is used to write the XXDP+ monitor on the device as a core image that is bootable. SAVM is not a directory entry. It will not show on directory.

*REN DK0:NEWNAME.EX DK0:OLDNAME.EX

Renames the old file. The devices must be the same.

*PIP DEV1:FILENAME.EX = DEV2:FILENAME.EX

PIP is used to copy a linked file from any device that can input to any device that can output. File data is not checked for format or checksums. (see note 1).

The output file is given todays date.

The user should make sure that the output filename doesn't exist already on the output device directory.

NOTE 1:
A PROGRAM THAT HAS BEEN "PIPPED" TO A XXDP+ DEVICE SHOULD BE LOADED IMMEDIATELY VIA THE "LOAD" COMMAND TO ASSURE THAT NO ERRORS HAVE OCCURRED DURING THE PIP COMMAND.

*TEXT DK0:FILENAME.EX

Update 2 includes the facility to execute a sequence of commands contained in an ASCII text file. This ASCII text file is created via the text command.

The named file is open for output and quotation marks (") are printed to indicate readiness to accept text. Each line of input is terminated by a carriage return. After the last line has been entered, the file is closed with a control Z.

Control C will abort text mode, returning to command mode and closing the output file.

The ; is used to start a comment which is to be printed during command file execution.

The $ is used to start a comment which is to be printed and followed by a halt during command file execution (such as "$PRESS P WHEN READY.")

*TYPE DK0:FILE.TXT

The type command outputs a file to the console device. The type command will accept * and wild character (?) construction in filenames, so that multiple text files can be printed with one command.

*DO DK0:FILENAME.EX

The DO command is used to cause the execution of a command file. The file is executed line by line, and must be terminated with a control Z executable files are created via the "TEXT" command, or via the XTECO text editor.

*FILCMP DK0:=DK1:FILE.EX

The file compare command is used to compare two files which are on different mediums. It can utilize the asterisk and wild character constructions.

*FILE DK2:=DK0:FILNAM.EX

Similar to the PIP command except that it can utilize the "WILD CHARACTER" and "ASTERISK" constructions.

If a file of the same name exists on the output device it will delete the old file.

*FILED DK0:FILNAM.EX — Deletes the file named from the device directory.

DEL DK0:.BIN — Deletes all files on DK0 with a .BIN extension.

!CAUTION!

UPD2 DOES NOT REQUIRE VERIFICATION OF A MASS DELETION COMMAND.

TYPING A CONTROL C WILL ABORT THE DELETION AT THE EARLIEST OPPORTUNITY.

FILEL DK0:.BIN — The FILEL command sequentially loads each file referenced. All files must be in ABS format. (if not a checksum error will occur.) This checks that each file can be correctly loaded.

FILEG DK0:.SAV — Similar to the FILEL command except that it loads and checks contiguous (core image) files instead of ABS format files.

```
*FILET DK0:FILNAM.EX
```

The FILET command tests all files named by reading them into a buffer to make certain that no device errors occur.

The file commands normally cause printing of the names of the files checked, their transfer address, and LOCORE and HICORE values on the console terminal.

The /N switch command inhibits printing of this information, so that only error printouts are output. Switches must be specified at the end of the command string.

FLOPPY SYSTEM TEST

TURN OFF THE POWER SWITCH LOCATED AT THE REAR OF THE DRIVE. CONNECT THE FREE END OF THE INTERFACE CABLE INTO THE KEYED CONNECTOR MOUNTED ON THE REAR PANEL OF THE CHASSIS. NOTE THAT THE POSITION OF THE CLIPPED PIN ON THE MODULE CONNECTOR MATCHES THE POSITION OF THE PLUGGED HOLE ON THE CABLE CONNECTOR.

REMOVE THE FLOPPY DISK DRIVE COVER AND VERIFY THE SWITCH ON THE CONTROLLER BOARD IS SET AS FOLLOWS:

1	2	3	4	5	6	7	8
C	C	C	C	C	C	C	O

PLACE THE XXDP+ DISK IN THE HAWK DRIVE AND SET THE DRIVE TO BOOT TO THE TOP DISK. TURN ON THE FLOPPY DRIVE POWER SWITCH, APPLY 2270 MAIN POWER AND SPIN UP THE HAWK DRIVE.

INSERT THE FRD440 DIAGNOSTICS DISKETTE INTO DRIVE 0 AND A BLANK DISKETTE INTO DRIVE 1. (Label side up)

RE-INITIALIZE THE DSD FLOPPY DISK SYSTEM BY HITTING THE 2270 CONTROL PANEL BOOT BUTTON. THE DRIVES CAN BE HEARD AND THE ACTIVITY LIGHTS ON THE FRONT OF THE DRIVES WILL COME ON BRIEFLY.

IF THE SYSTEM DOES NOT INITIALIZE:

ENSURE THE DISKETTES ARE INSERTED PROPERLY AND THE DRIVE DOORS ARE FULLY CLOSED.

ENSURE CHASSIS POWER IS CONNECTED TO THE SYSTEM POWER CONTROLLER AND THE POWER SWITCH IS ON

TRY CYCLING THE MAIN POWER SEVERAL TIMES.

ENSURE INTERFACE BUS CABLE IS CONNECTED PROPERLY.

ENSURE CONTROLLER DIP-SWITCH SETTINGS ARE CORRECT AS PER THE ABOVE.

THE XXDP+ BOOT SEQUENCE SHOULD BE DISPLAYED ON THE TERMINAL.

TYPE: R ZPFDCA

THIS PROGRAM WILL BOOT THE FLOPPY DRIVE AND THE TERMINAL WILL DISPLAY THE DIAGNOSTIC DISKETTE COMMAND PAGE.

IF THE SYSTEM DOES NOT BOOT FROM THE FLOPPY:

- ENSURE THE DISKETTES ARE INSERTED CORRECTLY AND THE FRD440 DIAGNOSTICS DISKETTE IS INSERTED IN DRIVE 0.
- CHECK THE CONDITION OF THE DISKETTES: THEY MAY NOT BE BOOTABLE IF PHYSICALLY DAMAGED.
- ENSURE THAT THE CONTROLLER DIP-SWITCH SETTINGS ARE CORRECT PER THE ABOVE.

AFTER COMPLETION OF A SUCCESSFUL BOOT, REMOVE THE FRD440 DIAGNOSTIC DISKETTE FROM DRIVE 0 AND REPLACE IT WITH A GOOD BLANK DISKETTE.

THE BOOT PROGRAM RESULTS IN A "#MODE:" PROMPT. SET UP FOR DOUBLE DENSITY MODE, FORMAT DISKETTES, RUN ACCEPTANCE TESTING AND CHECK ERROR STATUS.

WHEN USING THE FOLLOWING PROCEDURE ENTER THE UNDERLINED COMMANDS WHERE INDICATED. MAKE SURE THAT WHEN YOU TYPE IN ALPHABETIC CHARACTERS THAT YOU USE THE SHIFT KEY.

DSD-440 FLOPPY DISK DRIVE DIAGNOSTIC PROCEDURE

NOTE:THE UNDERLINE SIGNIFIES AN OPERATOR RESPONSE

```
REMOVE DIAGNOSTIC DISKETTE

DSD FLOPPY DISK DIAGNOSTIC WITH FORMAT CAPABILITY
TYPE 'A' TO DO ACCEPTANCE TEST ON 2 DRIVES
'H' FOR HELP LIST OF VALID COMMANDS
TYPE 'X' TO FORMAT A DISKETTE.  PROGRAM WILL ASK UNIT #
    TYPE '0 OR '1 PROGRAM WILL ASK SEQ FORMAT:?
    TYPE Y FOR STANDARD, N FOR INTERLEAVED FORMAT.

INSERT TEST DISKETTES (BOTH MUST BE OF SAME DENSITY)

DSD FRD440 V5G
( 0 - 157776 )
( 160010 - 160016 )
( 165000 - 165776 )
( 171000 - 171776 )
( 172100 - 171776 ) NOTE:    THESE ARE ADDRESSES IN THE 2270 SYSTEM
( 172300 - 172316 )          THAT ARE FOUND BY THE PROGRAM.  THEY
( 172340 - 172356 )          WILL NOT NECESSARILY MATCH YOUR CON-
( 173000 - 173776 )          FIGURATION.
( 177170 - 177172 )
( 177400 - 177416 )
( 177514 - 177516 )
( 177546 - 177546 )
( 177560 - 177616 )
( 177640 - 177656 )
(177776 )

#MODE: MEDIA-DEN-ALL  SET DENSITY TO (S,D):D     NOTE:  YOU WILL SOMETIMES
                                                        GET THE MESSAGE:
#DD MODE:  XFORMAT REALLY?Y                             SET DENSITY UN0
                                                        SET DENSITY UN1
UNIT:0<CR>
     -----                                              THIS MAY TAKE A MINUTE

SEQUENTIAL FORMAT?Y

                                              NOTE:  IF "MODE:" PROMPT
DENSITY = (S)INGLE, (D)EC-DOUBLE:D                   OCCURS TYPE: CNTRL-R
                                                     TO GET "DD MODE:"

          *** DELAY:  NOW FORMATTING DRIVE 0 ***

#DD MODE:  XFORMAT REALLY?Y
UNIT:1<CR>
     -----
```

```
SEQUENTIAL FORMAT?Y

DENSITY = (S)INGLE, (D)EC-DOUBLE:D

            *** DELAY:  NOW FORMATTING DRIVE 1 ***

#DD MODE: RES STATUS
 DDEN                   UN0   #BAD=0 #RD/WRT=1 #XFERS=0   B-DATA=0
                        UN1   #BAD=0 #RD/WRT=1 #XFERS=0   B-DATA=0
RESET ALL? Y

    *** NOTE: AFTER TYPING "A" THERE WILL BE A 45 MIN. TEST ***


#DD MODE:  ACCEPTANCE TEST SCAN CRC CHECKED  WPITING  READING  INTERRUPT
    ENABLED  WRITING  READING  FILL-EMPTY  RANDOM-RD/WRT  READING
    DEN=0
PASS FIN
                        UN0   #BAD=0 #RD/WRT=12667 #XFERS=35943  B-DATA=0
                        UN1   #BAD=0 #RD/WRT=12640 #XFERS=10960  B-DATA=0

*^2 ^3 ^4 ^5 ^6 ^7 ^10 ^11 ^12 ^13 ^14 ^15 ^16 ^17 ^20 ^21 ^22 ^23 ^24
       ^25 ^26 ^27 * <CTRL R>
#DD MODE: STATUS
 DDEN                   UN0   #BAD=0 #RD/WRT=34064 #XFERS=59617  B-DATA=0
                        UN1   #BAD=0 #RD/WRT=33978 #XFERS=21858  B-DATA=0

#DD MODE:

    (AT THIS POINT THE ACCEPTANCE TEST IS COMPLETE)

          IF THE ERROR STATUS RESULTS IN "BAD=0" AND "BAD-DATA=0",
          THE DRIVE SYSTEM IS CONSIDERED FUNCTIONALLY ACCEPTABLE.
          HALT THE COMPUTER, REMOVE BOTH DISKETTES AND REBOOT THE
          SYSTEM NORMALLY.
```

ADDITIONAL INFORMATION:

SOME FRD440 CONTROL CHARACTERS

CTRL R....RESTARTS PROGRAM AT THE PROMPT
CTRL Y....RESTARTS TEST SPECIFIED AT LAST PROMPT
CTRL X....SETS EXPANDED RX02 ERROR PRINTOUT MODE
<LF> ....TYPES TRACK, SECTOR AND STATUS COUNT FOR CURRENT UNIT

DUPLICATING DIAGNOSTIC DISKETTES

DUPLICATE TEST DISKETTES CAN BE MADE BY BOOTING UP THE FLOPPY DRIVE.

LEAVE THE MASTER DISKETTE IN DRIVE 0, PLACE A BLANK WRITE-ENABLED DISKETTE IN DRIVE 1 AND ENTERING THE FOLLOWING COMMAND.

#MODE:DUPLICATE SRC- UNIT 0<CR>
--- -----
ONTO DST- UNIT:1<CR>

THIS PROCEDURE WILL TAKE APPROXIMATELY 10 MINUTES.

ACCOPRESS®

25071	BLACK
25072	LIGHT BLUE
25073	DARK BLUE
25074	LIGHT GRAY
25075	LIGHT GREEN
25076	DARK GREEN
25077	TANGERINE
25078	RED
25079	EXECUTIVE RED
2508[illegible]0	YELLOW

GENUINE PRESSBOARD

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